

September 26, 1960

Aviation Week

and *Space Technology*

75 Cents

A McGraw-Hill Publication

Adaptive Filter
Detects Signals
Buried in Noise



Short SC.1 VTOL
at Farnborough

Piasecki Tests Ring-Wing VTOL Concept

VOI-SHAN HIGH-PERFORMANCE BOLTS TO STRUCTURE

VOI-Shan High-Performance Bolts are the lightest bolts. Offered in a variety of strength levels, up to and including 260,000 minimum tensile strength, some bolts may be used in the structure to 500°F with no loss of capability or mechanical strength.

VOI-SHAN HIGH-PERFORMANCE BOLTS

The most advanced manufacturing techniques, including cold working of the threads and heat treatment to 500°F, provide resistance to fatigue failure under the most adverse, even the selection of raw material to the best inspection of the finished bolt, the superior quality control standards using a true High Performance Voi-Shan Bolt.

Photo 1: The Voi-Shan Bolt is a true High Performance Bolt.

1. Standard Hexagonal Bolts (60,000 PSI)
2. Standard Hexagonal Bolts (100,000 PSI)
3. Standard Hexagonal Bolts (150,000 PSI)
4. Standard Hexagonal Bolts (200,000 PSI)



GOODRICH PRESENTS CREDENTIALS FOR AIRCRAFT CAPABILITY



Look—"instant" ground support!

Here's the kind of inflation that's easy to take—Goodyear's inflatable structures that can take to the air in folded form. Moosies cut on-site into tough, lightweight shelters, residences, fuel farms.

Shown above are a few recent developments in rubber bed fabrics by Goodrich.

① **Pack Flats of Pillow Tanks**—these huge containers can be set up, filled and pumping in minutes. Drained, they roll up like mats for compact storage and transport. Capable to 50,000 gallons or more.

② **"Soft Top" Redomes** for Goodrich provide all-weather protection that shrugs off snow, ice, 100-mph gales. In sizes to 300 feet in diameter, Goodyear redomes offer lightest temporary radar waves. Even radar antennas in inflatable are new design above.

③ **Personal Shelters of Air Mat** fold into light packs,

inflate in minutes. Provide comfort and protection in worst weather. Ability to hold air eliminates air-locks and need for constantly running compressor.

④ **Mobile Command Post** features Goodyear's 8-inch Air Mat fabric—with highest strength/weight ratios known. Stored in truck size, structure unfolds and inflates in room 25-feet-square in 15 minutes.

Portable—lightweight—super-tough—flexible—these are the product questions you can count on in Goodyear's designs. But the real secret is Goodyear's design-engineering ability to fashion rubberized fabric into shapes and configurations you'd never think possible. And the odds are that survival can fabricate the answer to your problem. Find out by writing on company letterhead to The Goodyear Tire & Rubber Company, Aviation Products Division, Dept. U-5714, Akron 16, Ohio, or Los Angeles 24, California.

Lots of good things come from

GOOD YEAR

MORE AIRCRAFT LAND ON GOODYEAR TIRES, WHEELS AND BRAKES THAN ON ANY OTHER KIND

VOI-SHAN
MANUFACTURING
COMPANY



a division of Voi-Shan Industries, Inc.
5863 Higgins Street, Culver City, Calif.



This is the
**SWAMI MOTION
DETECTOR**,
a complete portable
detection device
for perimeter
protection, fire
and anti-intruder.

NEW "POCKET RADAR"

**Sensitive, dependable,
inexpensive, unitized construction (it's small enough to fit
into an attaché case). Where can you use it?**

The SWAMI MOTION DETECTOR is a new low-cost intrusion detector system that instantizes a secured area with ultra high radio frequency energy sensitive to the slightest motion or displacement of an intruder. It is fail safe, simple to install, easily operated. And, it is virtually impossible to confound with counter-measures. Any tampering will cause an alarm.

Effective Range: From inches to hundreds of feet, with a single unit. Surveillance can be maintained over a full area, concentrically.

Flexibility: It can function as an omnidirectional or directional system, and can determine relative or absolute speeds of moving targets.

Durability: The sensor unit of the SWAMI MOTION DETECTOR is shock-resistant, and its service life compares favorably with that of conventional vacuum-tube detection devices.

Power Supply: Standard 115-volt outlet current or any battery supply DC.

Write for free brochure to:



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3011

AVIATION CALENDAR

(Continued from page 5)

- gives: National Astronomy Meeting, Ambassador Hotel, Los Angeles, Calif.
- Oct. 10-16-1962 General Conference: National Civil Aviation, 400 E. 8th Street, Village Hotel, Honolulu, Hawaii
- Oct. 10-12-1962 Meeting, Institute of Prosthetic Engineers, Sheraton Towers Hotel, Chicago, Ill.
- Oct. 12-14-1962 AFDR: Astronautics Symposium, Ambassador Hotel, Los Angeles, Calif. Sponsor: Air Force Office of Scientific Research, Society of Astronautical Engineers. (Open Meeting)
- Oct. 12-14-1962 National Symposium, American Vacuum Society, Cleveland Sheraton Hotel, Cleveland, Ohio
- Oct. 14-15-1962 Symposium on High-Speed Processing, Society of Photographic Scientists & Engineers, Washington, D. C.
- Oct. 14-15-1962 Midwest Conference, American Society for Quality Control, Broadview Hotel, Wichita, Kan.
- Oct. 15-16-1962 Radar Tech: For an Institute, Corresponding Office, 2nd Dist. St. Group, 1st Infantry Fort Rucker, Ala.
- Oct. 16-18-1962 Yon Conference, Airport Operations Control, San Francisco
- Oct. 17-18-1962 Joint Meeting, Institute of the Aeronautical Sciences and Canadian Association, Institute, Queen Elizabeth Hotel, Montreal, Canada
- Oct. 17-18-1962 National Safety Council's 96th National Safety Congress, Conrad Hilton Hotel, Chicago, Ill.
- Oct. 19-21-1962 Annual Convention, Southeastern Airport Manager's Assn., Fort Lauderdale, Fla.
- Oct. 19-21-1962 Symposium on Space Navigation, Institute of Radio Engineers, Double-Double Hotel, Columbus, Ohio
- Oct. 19-21-1962 Meeting, Society for Experimental Social Analysis, Grand Connaught, Berkeley, Calif.
- Oct. 20-21-1962 Symposium on Experimental Techniques, Institute of the Aeronautical Sciences, Shady Grove Hotel, Denver, Colo.
- Oct. 21-26-1962 Medical and Biological Aspects of the Control of Space, Unpublished Symposium, Grand Hotel, San Antonio, Tex. Sponsored by the School of Aviation Medicine. Arranged by South West Research Institute
- Oct. 24-26-1962 East Coast Circular on Astronautical and Navigational Problems, Institute of Radio Engineers, National Institute of Radio Engineers, Hotel Sheraton, Washington, D. C.
- Oct. 27-28-1962 World Electronic Devices Meeting, Institute of Radio Engineers, Hotel Sheraton, Washington, D. C.
- Oct. 27-28-1962 Industry Display, Aeronautical Flight Society, Los Angeles, Calif.
- Nov. 1-11-1962 Meeting, Radio Technical Committee for Aeronautics, Sheraton Park Hotel, Washington, D. C.
- Nov. 3-4-1962 Annual Hydraulic Conference, Pullman Hotel, Dallas, Texas. Sponsor: Various hydraulic divisions of Society and Civil Engineers
- Mar. 16-18-1962 National Conference on Aviation Education, Mayflower Hotel, Washington, D. C.



Eighteen-foot diameter radome of WSR-57 Stormfinder radar. System operates at 5 band, has 250-mile range.

**Dr. F. W. Reichelderfer, chief of the Weather Bureau,
calls this "the best weather radar in the world."***

Raytheon STORMFINDER shows a composite picture of the entire weather front over a 200,000 square mile area. The "weather eye" pinpoints and tracks storms 250 miles away, distinguishes hail, rain, and snow, probes the heart of a hurricane. It is ground-based . . . and designed, developed and produced specifically for weather detection and analysis.

EQUIPMENT CHARACTERISTICS

Its echos feature Sensitivity Time Control of 30 db between 10-100 miles. Triple display indicator units: (1) 7" EHI (range height indicator), (2) 12" PFI (plan-position indicator), (3) 7" A/I Scope for storm intensity measurement.

Power output	100 KW
Frequency	2.1 - 2.8 kmc
Beamwidth	25°
Coverage	110° in 4-45° @ 5 scans/min
Accuracy	200' @ 1-4 scale, 1/4 in

*Source: Raytheon before a House Appropriations Subcommittee, January 28, 1960



**EQUIPMENT
DIVISION**

For Raytheon Weather Radar Brochure,
Write: Director of Marketing, Equipment Division,
Dept. C2, Raytheon Company, West Newton, Mass.

ANTI-FRICTION BEARINGS:

While the countdown is on — the success of each missile depends completely on split-second operation of all moving parts: should the "bird" or its supporting structure, engines, drives, and support equipment lag — friction must be conquered.

And in the entire missile and defense industry, there is no more sweeping capability in friction-fighting than Torrington's.

On these pages, you can spot some of the vital missile support moves made to order for TORRINGTON BEARINGS. Here's your key to a few missile hold-down clamps and sensors (1), missile erectors (2), missile handling equipment (3).

In missile equipment of tomorrow, suggested on the facing page, Torrington bearings will help give the giddy craft to move into position.

around the giant rockets now under development (shown). Saturn spacecraft booster and guntry, number 4.)

Missile trains are due to start running the Nation's railways in 1965. Chances are that trains, missile erectors and so forth "busting the roof" of the missile wagons will all have the in common bearings by Torrington (number 5).

Perhaps even the straggling ground effect vehicles which may act as missile carriers during the late 1960s will spin their tires and lift their wheelsets into flying position, assisted by Torrington anti-friction bearings.

Returning to the present, look for these other important TORRINGTON BEARINGS applications in missile support equipment: bearings for large

TURNING POINT IN MISSILE PROGRESS

radar tracking equipment and radar smooth systems (the largest radar telescopes in the world — the Navy's 600-ft dish now being built in West Virginia — will turn to the skies on specially designed and built Torrington bearings). Heat doors on Titan and Atlas will swing on Torrington bearings — and deep in the hardened missile skin, large Torrington bearings equip the carburetor cylinders, which protect the missile and its booster from the shock of hostile nuclear weapons. Hydraulic cylinders, drives, and cable sheaves operate freely thanks to Torrington.

Around the missiles themselves, other Torrington products do more than their share for performance and reliability. Remember by now for their size and weight, Torrington could bearings take the load.

Send for your special report on missile and space age bearings.

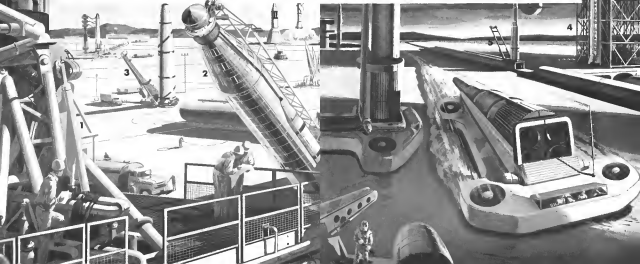
set of missile antennas and several surface supports.

Current Torrington research and development programs have brought about needle and roller bearings ideal for spacecraft control surfaces, and missile hot spots — rocket nozzles, combustion chambers, manifolds and shockwaves. Efficient operation at 1200°F and beyond are about to be conquered.

In helping missiles move about more easily, launch successfully, fly more reliably and accurately, Torrington bearings are playing a pioneering role in the Space Age.

TORRINGTON BEARINGS

THE TORRINGTON COMPANY Torrington, Conn. • South Bend 21, Indiana



CLIMATE CONTROL

Muscles and muscle support equipment are vulnerable to heat and moisture—must be protected from the external environment which they themselves bring about.

For instance, most air entering into a turbo waste-gate can condense and produce disastrous short-circuits and interference on high voltage locations; banks of electronic tubes generate so much heat that tube life and system reliability drop to undesirable levels. Thus, air-sensitive electronic systems are called upon to operate in the mode of readily fluctuating surface temperatures—but must maintain a narrow internal temperature within in order to perform as planned.

Eastern Industries makes it its business to solve this type of problem for you—to guard airborne and earthbound muscle electronics from the twin threats of moisture and temperature.

Eastern dehumidification permeation packs protect the waste gate of the Nike Hercules rocket shown below by supplying a flow of dry air under pressure, both in the waste gate itself and in its inside leak-out—without air flow out. Absorb a moisture ground-to-air missile risks, an Eastern Industries perme-

ation-dehydration pack features an automatic insulating dehydrator with a single cartridge—and far fewer components than conventional two-cartridge pack.

Eastern forced cooling units keep electronic systems on the job—when they generate internal heat at a rate too high for convection cooling, forced air circulation in heat sinks. If you have an electronic tube cooling problem ranging from 50 to 50,000 watts dissipation rates, check with Eastern Industries—the acknowledged leader in this specialized field. In electronic cooling components, Eastern Industries know-how is just as important as its complete systems. For instance, Eastern has just developed a constant mass flow effluve over a wide altitude range. The use of a constant torque magnetic coupling device permits selection of a smaller drive motor than ordinarily employed. Small, light weight aircraft pumps from the heart of every Eastern electronic cooling pack. Design with these high-speed gear pumps in mind—hundreds of these hydraulic units are available virtually off the shelf—or it can be adapted for you.

Eastern refrigeration cooling units safeguard elec-

FAIR WEATHER FOR MISSILE MISSIONS

tronic systems at a preselected temperature level—regardless of abrupt changes of ambient temperatures. These units can be furnished in the range of 100 to 5000 watts—meets up to the most rigorous military requirements.

Eastern Industries may also have the answer to your requirements in servo valves, actuators, amplifiers and complete servo systems—for both muscle and muscle support applications. Eastern offers you single system responsibility for complete servo systems and components. If you're looking for fast response, reliability, flexibility and light weight, write for the new Bulletin on Electro-Hydraulics—Eastern's review of servos and servo systems.

For both pneumatic and fluid systems, Eastern quick-disconnect couplings are the standard, lightest available for high-pressure conditions. Now available—a special automatic quick-disconnect coupling for missile servos. This new assembly can be obtained in the same capacity range, size, and

high quality as the standard miniature couplings. Write for Bulletin EDD-300.

Light weight rubber fuel control systems also come within the Eastern capability. Eastern has designed and built a complete turbine fuel and lubrication control system in weighing only two pounds. It contains: fuel pump pressure control valve, pressure regulating valve, oil pump filter and pressure valve, and starting fuel bypass valve.

Build new concepts in hydraulic power packs are old hat with Eastern. Hydraulic systems with self-contained power sources track on the use of constant gear pumps driven to 24,000 rpm for size and weight reduction down to the irreducible minimum. Other Eastern capabilities in muscle support equipment cover high-speed gear pumps, centrifugal pumps, hydraulic power units, quick-disconnect couplings, and servo systems. For a full appraisal of Eastern products and potential in muscle and missile servos, write for Bulletin 370A.



EASTERN INDUSTRIES, INCORPORATED

100 Skill Street • Hamden, 14, Connecticut
West Coast Office • 4205 Spencer Street • Torrance, California





Any time...any place...any mission

wilcox-developed AN/APX-44 TRANSPONDER
safeguards Army aircraft

Now being installed in U. S. Army aircraft, the AN/APX-44, designed and produced by Wilcox Electric, provides reliable RV, SN and ATC functions during any mission.

The AN/APX-44 automatically transmits specially coded identification pulses when subjected to radar interrogation. These pulses identify the Army aircraft as friendly and provide ground and airborne interrogators with position data, aircraft description and other helpful information. This transponder also releases primary radar replies to permit reliable tracking of the aircraft at extended ranges, despite conditions of inclement weather, ground clutter and dense traffic.

Wilcox has produced these airborne units in quantity and on schedule for Army installation.

The AN/APX-44 features minimum size and weight, modular construction, a crystal-controlled receiver and cavity-tuned transmitter. It is indicative of the electronic systems capabilities and experience of Wilcox.

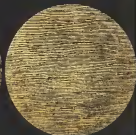
wilcox ELECTRIC COMPANY, INC.

Fourteenth & Chestnut Sts.,
Kansas City 27, Mo., U. S. A.

Is a FUNDAMENTAL Research Program Worthwhile?



Normal binary eutectic structure (250X)



New binary eutectic structure (250X)

We, at the Research Laboratories, are convinced that it is worthwhile. For example, one of the fundamental scientific problems being undertaken is a study of the mechanism of solidification of polyphase alloys.

This study is still in its early stages. However, we now have a better understanding of the solidification process. And we have demonstrated that the microstructure of certain eutectics can be significantly altered by controlled solidification. The contrast is illustrated above.

It is possible that these binary alloys with preferred orientation may have unusual physical and mechanical properties.

Perhaps you are interested in corporate-sponsored studies into the fundamental nature of matter. If so, we can offer a research environment that seems to stimulate scientists to extra achievement. It may be due to the way we encourage an informal cross-fertilization of ideas; or because of a unique complex of complementary services that free the scientist from routine analysis and experimental chores.

Opportunities for scientists in the physics of solids, liquids, gases, and plasmas. Current studies range from the fundamental properties of matter to the application of scientific knowledge to promising new products.

For more specific information, please write to Mr. W. D. Walsh, at the Research Laboratories.

RESEARCH LABORATORIES
UNITED AIRCRAFT CORPORATION

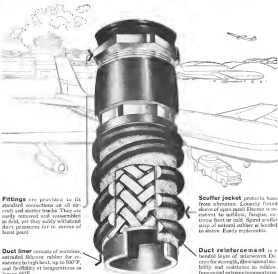
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THE ONLY JET STARTER HOSE GUARANTEED FOR 4500 STARTS

UNIQUE CONSTRUCTION OUTLASTS AND OUTPERFORMS ALL OTHERS



Fittings are provided to fit standard connections on all aircraft and starter trucks. They are easily removed and reassembled in field, yet they safely withstand duct pressures far in excess of burst point.

Duct liner consists of stainless, extruded silicone rubber for resistance to heat, up to 500°F, and flexibility at temperatures as low as 65°F.

Scuff jacket protects hose from abrasion. Locally fitted sleeve of open mesh. Ducts in constant to sudden, fangs, extreme heat or cold. Spent scuff strip of natural rubber is bonded to sleeve. Easily replaceable.

Duct reinforcement is a bonded layer of interwoven Dacron for strength, dimensional stability and resistance to mildew, fungus and extreme temperatures.

Jet Starter Hose, pioneered and developed by Thermoid Division, is the only hose guaranteed to perform satisfactorily for a full year or 4500 starts — is the only starter hose approved by the government and is the choice of major jet operating airlines the world around. Exhaustive use has demonstrated that

Thermoid-Quaker Jet Starter Hose outperforms other hose by more than three to one. For more information on this outstanding jet starter hose see your Thermoid Division distributor or write Thermoid Division, H. K. Porter Company, Inc., 360 Whitehead Road, Trenton 6, N.J.

THERMOID DIVISION



H. K. PORTER COMPANY, INC.

Thermoid Division manufactures rubber and thermoplastic extruders, high voltage electrical equipment, electrical wire and cables, wiring systems, machine tools, hydraulic control systems, pumps, valves, tanks, piping and flow control, air conditioning and heating, and more than 1000 other products.



Hiller J-2 air engine starting, boots and jacks up payload at 10,000 ft.



HC-130 hoist hoisted to 1000 ft. payload, 10,000 ft. altitude.



HC-130 hoist hoisted to 1000 ft. payload, 10,000 ft. altitude.



HC-130 hoist hoisted to 1000 ft. payload, 10,000 ft. altitude.

For more information on this film strip



HC-130 hoist hoisted to 1000 ft. payload, 10,000 ft. altitude.



HC-130 hoist hoisted to 1000 ft. payload, 10,000 ft. altitude.

THE ARMY GROWS 'EM TOW'N

How the Miller 12 E Became First Choice of Commercial Operators

From the day it went into commercial service the Miller 12 E had a head start. It had an Army-proved H-33D airframe and an Army-proved H-33D drive system that hadn't begun to exploit its full strength.

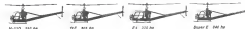
The next step revealed the specs on what light utility helicopters can do. Exploiting on the H-33D the dynamic components with a 300-hp Lycoming engine's power, light helicopter "firsts" of the kind above were bound to happen. Greater profitable operations are flown every day, wherever there's an E.

That's why the 12 E has become first choice — it's the most economical helicopter purchase today.

Designs are new thing. Deliveries on time. Build some fast.



PAID ALTO CALIFORNIA, WASHINGTON, D.C.
Aircraft Engineering Division - San Carlos, Calif.



H-33D 330 hp

H-33E 330 hp

H-33F 330 hp

Super E 330 hp

CAPABILITIES FOR DEFENSE



Solar Eclipse

Electrifying

If satellites and space vehicles stop "working", they are simply high cost space debris. Reliable power supplies are mandatory.

To meet this requirement, extensive Westinghouse research and development efforts are being applied to perfect reliable, compact, lightweight systems that will convert solar and nuclear energy into unflinching, long-life sources of electric power.

Westinghouse is investigating many new electrical power systems, but primary efforts are directed in six important areas. These are: 1. Thermoelectric; 2. Thermionic; 3. High-efficiency solar cells; 4. Photoemission; 5. Magnetohydrodynamic; 6. Rotating magnetic generation. This work is being performed by the Aircraft Equipment Department, Lima, Ohio, supported by the Central Research Laboratories and the Astronuclear Laboratories, Pittsburgh.

Space power requirements—in not too many years—will be measured not in watts or kilowatts, but in megawatts. This need presents formidable technical problems.

We are making progress toward their solution.

Westinghouse



Circle 1

Space

Moon, up 14 days



Spiral nebula in Orion (left)



Spiral nebula in Virgo



Spiral nebula in Andromeda



Spiral nebula in Cassiopeia



Flame-like nebula in Epsilon



Planetary star cluster in Cassiopeia



Saturn and ring system



Head of Medusa's Cloud



Nebula in Sagittarius



NEW ROLES FOR AMERICA'S NO. 1 JET TARGET

Now ground launched as well as air-launched, the Ryan Firebee can be used even more effectively as a jet target in all kinds of weather and terrain, and by new missions for the Armed Forces.

Originally shot into the air from a ground launcher, the Firebee is freed from dependence upon launching planes and airports. And ground-launching increases reliability, cuts launch costs and eliminates time to acquire the target by tracking radar.

Thoroughly proven in over 3000 flights in which high speeds (over 600 mph), altitudes (over

60 000 ft.) and range (over 600 miles) have been achieved, the Firebee also has remarkable low-altitude performance. Repeatedly, Firebee has flown missions as low as below 700 feet, 25 miles from ground control, to draw the fire of ground-to-air missiles designed to knock out low-flying enemy planes.

In low-level flights, ground-launching saves time and costs because now the Firebee can be brought to low-altitude faster and more simply than from high air-launch altitudes. All Firebees of the future will have this important capability.

Ryan Offers Challenging Opportunities to Engineers

RYAN BUILDS BETTER

AIRCRAFT • MISSILES • COMPONENTS • ELECTRONICS

Ryan Aeronautical Company, San Diego, Calif.

September 26, 1960

Aviation Week

... Space Technology

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► Data from last year development program is in final report stage and company hopes to have flight hardware soon

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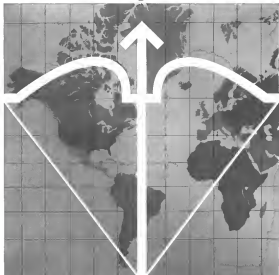
AIRBUS ENGINEERING

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EDITORIAL

Welcome to Denmark

This is an unabashed parade of pure praise for an enterprising country that has developed the art of making the American tourist feel at home away from home and has taken decisive steps to break the hotel bottleneck that is now the top issue on transatlantic air travel. The American tourist trade to Europe has grown into a multimillion dollar annual affair that moves more foreign exchange into European coffers than any other single item of trade. With the advent of the Boeing and Douglas jet transport fleets on the transatlantic run this year the capacity for whisking people across the Atlantic in a fraction of a day has grown enormously. Yet facilities to accommodate tourism in Europe have not kept pace. The traditional gateways to Europe of London and Paris have become horrendous hotel bottlenecks with few signs of any significant increase in hotel capacity on the horizon in either capital.

Pleasant Contrast

Thus it is refreshing for an American to visit Denmark and see what the enterprising Danes have done to usher one of the transatlantic tourist markets into the northern gateway of Europe. You are aware of the difference as immediately on arrival at Kastrup's new ultra-modern air terminal building. Here the Danish immigration officers stamp green American passports with "Welcome to Denmark" beneath the official insignia and present each American with a message of welcome from the Danish press minister and a classic Viking ship button. From then on the Danes exercise ingenuity in trying to provide every means for the American visitor to enjoy and understand Denmark and leave a reasonable portion of their tourist budget in Danish coffers. All of this is done with an air of pleasant efficiency that is a welcome contrast to the rigorous malice of mass, Pan-Am hotels and the bored indifference of the British hostesses.

Five new modern glass and steel hotels have sprung up among the verdigris-croaked copper towers of Copenhagen's skyline—more modern hotels than have been built in postwar London and Paris combined. They include the superb 21 story Scandinavian Airlines System hotel that rises next to the main downtown air terminal. To ensure that no tourist goes without a bed in Copenhagen the Danish tourist bureau maintains a special

leasing office that copes with any emergency even to finding rooms in Dan's homes when the hotels overflow. Special dormitories are opened to foreign students during the summer rush. The Danes even provide large scale baby-sitting facilities where visiting children are organized into groups for activities suited to their age levels while their parents can pursue their own interests.

Tourist Attractions

In the heart of Copenhagen there is a continuous demonstration of Danish culture to quickly acquiescent visitors with the delights of local food. Close by is a large collection of the work of Danish craftsmen in silver, ceramics, furniture and textiles with facilities for ordering and shipping and for handling all customs problems. You will hardly be in Copenhagen long before you are faced with the famous Carlsberg and Tuborg breweries to tour their facilities and sample their products. If the pace gets too rigorous, as it often does, there is a tremendous hot bath facility on the scale of Tokyo Onsen, where expert masseurs put you back in shape to continue the fun. When SAS has a transpolar or transatlantic schedule that gets into Kastrup in the early morning hours it alerts the bath house and handles all its weary tourist passengers through the steam, dry heat and icy pool, and gives them some of the famous Danish open face sandwiches and beer before sending them on to their ultimate destinations.

It is difficult to fully convey the friendly atmosphere of Denmark toward American tourists because so much of it is not in the formal evidence outlined above but in the subtle dealings with its people where the time period always turns out to be pleasant. All of the delegates to the 36th annual general meeting of IATA held in Copenhagen earlier this month as well as the thousands of American tourists who passed through this gateway to Europe last summer will heartily endorse these sentiments. Other countries with more resources and a larger stake in the transatlantic tourist trade would do well to follow Denmark's fine example in providing the proper facilities to equip this market for the future.

—Robert Hoots



D DAY, THE LACK OF RECONNAISSANCE AND A FAULTY COMMAND

At 10:15 p.m., June 5, 1944, Lieutenant Colonel Meyer, command intelligence chief of the Fifth Army, interrupted a relaxed game of cards. He held a message intercepted from Allied Headquarters, a message the German General Staff knew would allow Allied invasion within 48 hours! But the card game placidly continued. No reconnaissance verification. Though a 2,000 ship, 20 mile wide invasion fleet clogged the English Channel, not a single Luftwaffe plane reported this progress. And so Field Marshal Rommel, commander of German forces in the area, was not notified until after it had been decided to leave in Germany. Later, urgent pleas for paratrooper divisions in reserve near Paris were rejected by higher authority in Germany who thought the Normandy invasion was merely a distraction.

Why such confusion, particularly when Rommel's

reconnaissance included the study of German radio intercepts? The answer, unlike the reconnaissance-warfare can be found in Rommel's "Type" was obsolete for their day... lighter aircraft, modified for the important reconnaissance mission. Result: lack of reconnaissance... D-Day success for the Allies.

From the beginning of command on the home of the war, reconnaissance has helped shape history. Today CAA's specialty in this area is making aircraft history in the workings of the First World. Typical of CAA's contributions in "W.L.P. Visual Integrated Presentation, data display system, KA-30 the world's most versatile aerial camera. SOLO the only aircraft equipped with "see before you" guidance system.



CHICAGO AERIAL INDUSTRIES, INC.

30 WEST NORTHWEST HIGHWAY, BARRINGTON (ILLINOIS) - where DAYTON, LOS ANGELES, WASHINGTON, D.C.
OTHER DIVISIONS: KYNTRONIC CHICAGO AERIAL SUPPLY Franklin Park (Ill.) PACIFIC OPTICAL CORP. (Japan), Calif.

WHO'S WHERE

In the Front Office

D. Hiram H. Koenig, assistant director for acquisition and flight systems in VNA's Office of Advanced Research Programs, recently visited NATO's Air Force, Jr. as deputy in the Advanced Research Program Director.

John B. Montgomery, vice president General Electric Co., New York, N.Y., is VNA's assistant general manager of CTA's Flight Research Division, Technical Office.

William Link, president Ideal Aircraft Inc., Clarksburg, W.Va., is director of R&D, Indianapolis, Ind.

Frank S. Fisher, a division, The Parker Aircraft Corp., Cleveland, Ohio, is VNA's director manager of the company's Parker Aircraft Division, Los Angeles, Calif.

Dr. G. C. S. Butler (P.S.M., etc.) is a director, Idaho Marshall Industries Inc., Clarksburg, Calif.

John H. Carter, president, Information Technology, Lubbock, Texas, recently visited the Bureau (VNA) Division of Risk Corp., Washington, D.C.

F. Kenneth McLaughlin, West Coast manager for Radar & Instruments, Santa Ana, Calif., was president in charge of all activities for American International, First Coast, Calif., with headquarters in South Hills, Calif.

Morton D. Lockwood, vice president, Stern, Greenberg Co., Great Neck, N.Y., is director of Stern, Rand Corp., New Haven, Conn. (VNA's assistant).

May W. Belcher, vice president, engineer, Oakwood-Holmes Manufacturing Co., Dallas, Tex., is a subsidiary of Long-Term Electronics, Inc.

John H. Ziff, a division of North American Aviation, Inc., Downers Grove, Ill., is president of the following in our products: Dr. Dora O. Newman, responsible for program and maintenance, completed control loop system; Robert T. Jones, in charge of engineering and directing operations; and, respectively, D. S. Newman, P. H. Newman, and J. H. Newman, in charge of research, development, and testing, respectively.

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(Continued on page 132)

INDUSTRY OBSERVER

►Three Rans in helicopter are flying at Sikorski and three at VNA in preparation for delivery to Rans of two Sikorski 5-5s and a VNA Model 44 helicopter. Rans are expected to receive all three within the next several weeks (AV Sept. 29, p. 27 and Nov. 21, 1959, p. 25).

►USAF is considering getting a portion of the 5800 million voted by Congress for interceptors into two places, Lockheed F-106s as they can be used for some training for the North American B-70 bomber. Lockheed F-106s and Republic F-105s also have been proposed for this training, but F-106s is a different aircraft with its characteristics more similar to the B-70. Crew would fly with Air Defense Commandable to Strategic Air Command later along with their aircraft.

►Two systems more implemented than the latitude rocket boosters (AV Sept. 5, p. 76) are being considered by USAF for communicating with aircraft and being down an ocean-based radio beacon. This is a 'radio' system, communications system, using a radio beacon to report for a ground-to-air-to-ground link, and an aircraft positive control communications system involving an aircraft-mounted receiver for large area coverage. Wright Air Development Division is expected to have the responsibility of other systems should be adopted.

►Rollout of first Vort 107 Model II is scheduled for early October. Components of the Assembled Vort II, which were powered by two General Electric T56s rated at 650 shp each, to the advanced configuration. This includes an increase in the GE T56-100's shp to 1,650 shp each. Complete dynamic testing of Model II is to start in 2,500 shp to the C15-110, rated at 1,250 shp, when that engine completes certification. First Vort 107s delivered to New York Airways will use the certified-160 engine.

►Army Division of American Bosch Arma Co. is developing highly sensitive and guidance computer for the hard-landing laser optic in NASA's Ranger program.

►NATO is developing a general operational requirement for a STOVL transport aircraft to logistic support of VTOL fighter-bombers. Design requirements have not yet been released to industry, but are believed to be based on a 25-ton payload, a cruising speed of 250 kts and takeoff from a 500 ft strip, clearing a 50 ft obstacle at end of the strip.

►Six companies will be selected probably by Oct. 1, to participate in the extended Phase II study of the small, multi-Megawatt, microsatellite, satellite system (AV Sept. 19, p. 24).

►USAF's Guidance Research Laboratories is developing airborne landing equipment that will enable aircraft to dispense air or rocket fuel or rocket fuel or stratospheric, producing loads through which aircraft can land at fields not equipped with runway aids. Research report they have developed such equipment, using basic techniques developed originally by the U.S. (AV Aug. 19, p. 33).

►British, French and German designs appear to be major competitors for the NATO VTOL fighter competition. NATO specifications require a high takeoff performance at sea level and maximum speed above 4,000 ft. British Derby (DB-1) and advanced version of Hawk (Hawk) special lift engine seem to be being used in proposals.

►USAF Bell Helicopter Division has had industry bid work on high-altitude reconnaissance plane and procedures. RMD selected 73 companies to the contract.

►Lockheed is preparing a VTOL version of its F-104 fighter for Europan use with two lift jet engines installed on the wings.



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As your jet air liner streaks sky today, **UNION CARBIDE SILICONES** are shown to help. Silicones aided in its manufacture, too. This giant first **COO** slipped easily from their original mold because of silicone mold release agents. Polyether foam seat cushions were formed under the non-stick control of silicone surfactants. Soft, flexible **COO** oxygen masks, of oxygen and non-resistant silicone rubbers, fit facial contours without irritating the skin. Silicone fluids damp out vibration in vital, sensitive instruments. Silicone rubber door seals **COO** never lose resiliency even in extreme temperatures, won't bubble or shrink. This constant flexibility makes it the basic material in bladders used for construction

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UNION CARBIDE SILICONES

Washington Roundup

Defense Dollar Thaw

Defense Department is finally releasing additional money for key weapon programs. It now expects to allocate virtually all of the \$55.9 billion voted by Congress for fiscal 1961. This was a net \$661 million increase over the budget proposed by the Administration.

The freeze is thawing rapidly as the \$621 million withheld under the mid-August defense financial plan. This August plan released over \$470 million additional for key priority programs. Now more is being released. Fiscal funds have now dwindled to about \$416 million and some of this is single money withdrawn from obsolete programs which the Pentagon has not yet reauthorized.

Now has \$800 million to go ahead with development of its F-105 and F-4E. This makes over \$1.3 billion available for the whole. Fort Belvoir, Miss., program in fiscal 1961, \$30 million more than Congress authorized for it. The extra money was withheld from a replenishing fund.

An Force has more money for future. Original \$300 million budget was increased \$50 million last month. Now another \$115 million has been added.

Defense already has released \$85 million for Lockheed-C-130As for MA-1C interim modernizations. That is \$137 million more in stock for USU when it decides on the second type of aircraft it wants for interim modernization.

An Force also has shifted its budget to provide \$10 million to begin a 1,100-va tactical missile program. Lockheed Air Command has studied both cruise and ballistic missile tests for this program.

USAF has added \$29.4 million to the Mitchell budget, bringing it to \$36 million for fiscal 1961. Project Photo nuclear target budget has been doubled to \$14 million. The X-15 program has been increased \$2.6 million to a \$5.6 million total, and the Dyna-Soar budget is up \$5 million to a \$15 million total.

Critics Criticized

Republicans are turning the legitimacy of defense efforts into a major campaign issue at the same time that they are ratcheting the defense effort. Vice President Richard Nixon and other campaigning Republicans are finding it popular to attack Democrats endorsing U.S. military action, or foreign policy, especially when Soviet Premier Nikita Khrushchev is visiting the United Nations.

Sen. William Fulbright criticized for the Democrats last week, charging that Nixon was asking them to "join him in a conspiracy of silence, or misrepresentation." Sen. Fulbright accused Nixon of trying to make criticism of foreign policy a criminal act. But he said Democrats would be damned if he failed to discuss it in full and clearly as possible.

Resisting government and industry interest in satellite communications was not dead last week, at the end of Federal Communications Commission to Bell Telephone Laboratories at Hialeah, N. J. is known as radio relay experiment. Much of the current interest has been prompted by the success of the Echo project.

FCC currently is considering satellite applications for specific frequencies to use exclusively with communication satellites. American Telephone & Telegraph Co. (AT&T) is one of the major applicants. The second in the core is telecommunications, and TUC doesn't expect to push a defense in satellite research.

Latest Canadian proposal to make U.S. Canadian defense production during more of a trade involves a trade of CL-44 transports for U.S. radar installations. One firm would buy \$175 million worth of radar sets and electronic installations. The U.S. has built on the Canadian order. In return, the U.S. would buy 75 of the Canadian transport cargo transports, costing \$150 million for M-15.

Col. A. J. Keston has applied Col. John P. Stapp is head of WADD's Aerospace Medical Division in Dayton. Col. Stapp has been assigned to the Aerospace Medical Center at Brooks AFB, Tex., as special consultant for advanced aerospace studies.

Caribbean Politics

Rep. Orrin Rosten is urging the State Department not to disturb the Atlantic Missile Range Station in the Dominican Republic. Rep. Rosten, chairman of the House Science and Astronautics Committee, is concerned that State may decide to close the station as part of the diplomatic overtures planned against the Dominican Republic under a recent Department of American Science agreement.

Brotherly is with the U.S., over the Dominicans have not raised any objection to the station. The station has no military role, and it is not in the line of the AMR claim. It seems to have the signal on the relationship table between Cuba, Central and Pacific West, and this function could be transferred to another island in the general area without much trouble.

—Washington Staff

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Soviet Tug Carries Balloon on Deck

Rear Navy fleet tug Kaptan V. Polkov was photographed on the North Central Atlantic, carrying a ship-shaped balloon on its deck. Defense Department said its deck facilities would be capable of supplying a helicopter. Ship mounts a safe variety of electronic gear and probably is capable of operations in a large reconnaissance vessel.

Two Methods Found To Eliminate Contrails

Washington—Two systems which actively eliminate the visible contrails behind a jet engine at high altitude have been developed at the Aerophysics Laboratory of Air Force Cambridge Research Laboratories.

Operating separately, one system is to induce the use of water vapor particles in a jet exhaust so that they are not visible to the eye after they leave the engine and condense in the cold air at high altitudes. Balancing in particles is accomplished by scaling the exhaust with solid dust-like particles. The small amount of water vapor which adheres to each dust particle is not visible to the human eye when it condenses to ice.

The second contrail reduction method involves the use of a special fuel which produces less water vapor than JP-4 when it is burned. The combustibility of producing a contrail is greatly reduced using this fuel because a minimum amount of water vapor is required to form a contrail.

Air Force plans to install the exhaust scaling system on its current bombers and to use the special contrail-reducing fuel on the deck, missiles carried by the bombers. Despite operations with jets, there have been difficulties in the past because the great difference in bomber and deck contrail size made the bomb or missile contrail distinguishable.

Scaling system has been tested successfully on a B-47 bomber (AW Sept. 19, p. 27).

Use of the special fuel by bomber units was rejected because of logistic problems. Weight of the exhaust scaling system planned for the Boeing B-72 will decrease weight less than 1%. The

complete system for B-72 aircraft engines will weigh about 1,000 lb., of which the scaling system will account for 2,000 lb.

The B-72 system is scheduled to be ready for operational use next year.

Charles I. Anderson was primarily responsible for the contrail-reducing concept, and Seymour J. Benken was the project director.

Contractors which contributed to the two-year project include Allied Research Associates Inc., Cornell Aeronautical Laboratory, Avco Research Foundation and Microchem Research, Inc.

Fair Share Urged For Small Business

Washington—Small Business Committee recommended last week that weapon system contractors be required to include in writing an outline to afford small firms the opportunity to submit proposals on subcontracts.

The committee, reporting on small business aspects of weapon system contracting, said that the justification should be subject to approval by the contracting officer.

The committee also urged Defense Department procurement officials to bring the advantages of subcontracting with small business firms "constantly and forcibly" to the attention of weapon system contractors.

"For this subcontracting program to be successful in terms of greater participation of small producers within the weapon system," the committee recommended that "the procurement officials of the military service pay same attention to the interest of Congress that small business firms at all levels receive a fair share of government purchases..."

News Digest

Belgian government, which had declined to cancel its Lockheed B-59C production program because of the economic impact stemming from loss of the Belgium Congo plan deliveries toward the U. S. for its support of United Nations action within the Congo (AW Aug. 15, p. 22) are pressing that total order from a planned 160 to 75 (AW Sept. 19, p. 29). Meeting to reach final decisions on financing, including decisions of U. S. mutual aid funds, was scheduled to be held in Brussels late last week. SABCA, Belgium firm tooling up to manufacture Belgium's B-59C plus 64 of the 475 West German aircraft on order, is scheduled to get its program order was by next June, having not yet received contract per month.

Eastern Air Lines has sold its entire fleet of 15 Lockheed 349A Constellation, headquartered at Louisville, Ky., since last April to the Frontiers Equipment Co. of New York. The purchaser expects to sell at least the planes in a world-wide basis.

Consensus Aircraft Engineering Corp. achieved the first line production AG-1AF Mohawk helicopters to U. S. Army Sept. 15. AG-1AF is a four-seater twin which becomes -1B1 version with the addition of anti-landing gear and the JCF with infrared surveillance equipment. Consensus has built one prototype, Mohawk, will build a total of 45 -1AF models and 17 each of the -1B1 and -1C1.

Shurt G. McLean has been named assistant to Martin Co. Board Chairman George M. Beiler, based in the Washington office. McLean formerly was manager of Bell Aircraft Corp.'s Washington office.

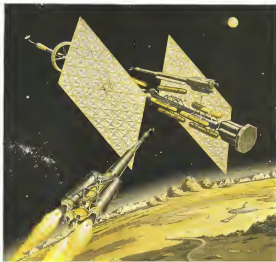
Chance Vought Aircraft has been awarded \$68 million for Fiscal 1968 production of the Navy F8D-2N Mach 2 subsonic, beginning to \$102.6 million the final government funds committed for the F8D-2N.

Defense Communications Agency has issued its own findings in its competition to select contractor to build new Defense National Communications Control Center in Washington (AW Sept. 12, p. 18). Agency hopes to select winner by early October. Those invited to submit oral statements include: General Electric, Radio Corporation of America and Texas Instruments. The Alpha Corp., Philco, Western Electric and Western Union.



CANADA IS AT WORK AT EVERY MISSILE RANGE IN THE FREE WORLD!





STEPS IN THE RACE TO OUTER SPACE

Mars Supply Fleet

When men first sets up colonies on Mars, his life will revolve on a Mars Supply Fleet shuttling these Earthly regulars in between with supplies, equipment and personnel.

The fleet will be composed of two basic vehicle types, both shown in the illustration above. The large ships with rectangular solar reflectors will be the long range backbone of the fleet. Assembled in orbit of prefabricated sections rocketed up from Earth, these high-capacity carriers will have a low-thrust electric propulsion, their operating current will come from thermionic converters, heated by the concentrated rays of the reflectors.

The Solar Ships will be loaded and un-

loaded, at both ends of the voyage, by work horse Ferry Rockets (described) launched by booster. The ferries will be designed to carry the long range cargo containers within a hop just forward of their engines. In the nose of the Ferry Rocket is the personnel and operating section with a universally mounted service/guidance compartment. This guidance will be fitted with directional radar, an optical telescope, and full astro-navigation equipment.

The Mars Supply fleet will complete each assigned mission in one to two Earth years, depending on whether or not the

Solar Ships are equipped with auxiliary boosters for extra orbital speed.

ARMA, now providing all-oried guidance systems for Atlas rockets of the Air Force AGAS/ICBM, is in the vanguard of the race to outer space. At **ARMA**, primarily funded research programs in space technology are studying super sensitive inertial devices for navigation and attitude instrumentation. For this effort, **ARMA** seeks scientists and engineers experienced in astronautics. **ARMA**, Gordon City, New York, A Division of American Bosch Arma Corporation.

AMERICAN BOSCH ARMA CORPORATION

AIR TRANSPORT

IATA May Ease Ban on Manufacturers

Final decision on whether manufacturers can attend future IATA meetings rests with executive committee.

By L. L. Dots

Copenhagen—Chances that the current ban on manufacturers at the later national Air Transport Assn. general meetings will be at least partially lifted now appear strong as a result of protests against the restriction in 22 countries during the closing session of the sixteenth annual general meeting here.

Although the committee voting in favor of an easing of the current prohibition against manufacturer attendance did not represent a majority because of a number of abstentions, they outnumbered the active opposition which was able to muster but 19 votes in favor of restriction. Final decision now rests with the executive committee of IATA which originally declared Copenhagen off-limits to the manufacturers during the IATA meeting (AW Sept. 19, p. 40).

It was generally conceded here that a large majority of the executive committee backs a continuance of the ban at all future general meetings on grounds that restriction of the manufacturers disrupts delegates from regular IATA business. Airlines opposing the stand generally have highlighted an acute sense of the world class IATA general meetings give them their only opportunity to meet with manufacturers and discuss operating and maintenance problems and new equipment projects.

Easy Range

Some most airlines expressed in the executive committee are located within easy range of manufacturers or their district offices the importance of direct communications with manufacturers at IATA meetings was not an issue when the executive committee invoked the ban immediately following last year's general meeting in Tokyo. In Tokyo manufacturers were allowed to offer their annual small meetings but were barred from IATA's main action.

Total ban was not very effective, but was with a letter from IATA's director general Sir William Hildes, to all manufacturers which established IATA's interest in Copenhagen out of bounds to all manufacturers. All but one manufacturer, Sud Aviation, which had one representative on hand during this year's meeting, complied with the demand.

Despite a general finding among executive committee members that the restriction proved to be a satisfaction arrangement here it now appears likely that the committee will bow to the wishes of the 22 dissenting airlines in a compromise move that will undoubtedly cause some still ground rules in air-

the degree of manufacturer participation at evening IATA meetings.

In addition, the action may help to reduce some of the protests or dissensions against the executive committee that occurred during the general meeting here. A number of delegates representing smaller airlines expressed the feeling in Stockholm, Sweden, that the executive committee appeared to exert its full executive power in terms of its immediate action to its members while relying on other means considered of second importance by the small carriers.

For example, the committee here left large seats present at the assembly floor open to the members of the IATA public domain (John Bunker), but allowed demands for stronger manufacturer procedures to

lips, the action because of such matters was not the subject. One delegate told the assembly during the closing plenary session that unless enforcement proceedings were tightened and strictly pursued his carrier could see no need to remain a member of IATA. Another delegate told American Wires that flight to act as a warning of enforcement requirements could go along the Traffic Conference, which began in Caracas last week, another full week.

On this subject, W. H. L. DeBoer, chairman of IATA and chairman of the new Traffic Conference called for more cooperation and closer cooperation in a word of maintaining IATA's unity. He charged that political considerations often proved solutions to purely commercial problems in the conference and cited the failure of two carriers to reach accord on South Pacific routes and lines because of a fear that other governmental bilateral discussions could be prejudiced by a conference agreement.

Small Differences

DeBoer said results in strife on matters in the Central and North Pacific areas showed from differences in matters of small importance and added:

"In essence, it seemed that the members to agree on facts. Large differences of opinion in the matter of some particular facts."

He warned that voting procedures in the conference may be subjected to "drastic alterations" unless more far and less talk are expected into future meetings. He told the assembly that current voting procedures were designed to prevent small carriers from seeking from inter-carrier agreements which might be harmful to them but that such procedures were not designed to permit small carriers to vote with agreement which did not in fact affect their operations to the slightest degree." He added:

"I prefer conferences, facts as to be voted down by local carriers which have no interest in the matter, thus rendering agreement will be impossible."

In this connection DeBoer has on the very issue which created the small rebellion within the annual general meeting this year the date he made it was in many ways a point in this time. It is unlikely that will reflect in a break in the one carrier remaining to give them a voice in IATA matters, the right of vote in traffic conferences. Second and Wagon Airlines, which

New TWA Chief

New York—TWA World Affairs' board of directors last week was expected to accept the appointment of Fred M. Glen as president of the airline to succeed Charles E. Thomas. Thomas recently resigned from the TWA post (AW Aug. 1, p. 28), which he took in July 1958.

Glen, now vice president and vice chairman of the board of the Denver Post-Building Corp., has a wide background in aviation. He was director of aviation for the Port of New York Air Authority from 1949 to 1955. He was past chairman of Air Cargo, Inc. 1947-49; a vice president of Capital Airlines, 1946-47; chief of staff, Pacific Division, Air Transport Command during World War II; American Airlines director, 1939-42, and chief aviation consultant, air safety board of Civil Aeronautics Board, 1956-59.

always has been a strong dissenting force in the ICA Local Councils, but its voting strength within the councils, at least for the moment when it was divided to separate eggs and parangos into its voting procedures. Other small council groups expressed suspicion that voting techniques may be used to deny to their voting rights on overall firm structures which, they claim, have a direct bearing on the construction of local rates.

Conference voting procedures have, in fact, been under study for some time by the Traffic Advisory Committee but the group has been unable to offer any revised criteria because of the sharp split between regional operators and large international carriers. Nevertheless, changes of some sort in conference operating procedures can be expected if the Geneva meeting is bogged down by failure to reach agreement on major issues.

"If you want the Traffic Conference to be completed in the time allocated, and if you want to avoid criticism of Traffic Conference procedures then your representatives must be instructed to reach agreements quickly and not to hold out until the last possible moment. If you want to avoid a last minute breakdown, then your representatives must stay until the job has been completed, and then should receive payment in the size of their entire salary."

Several practitioners proposed an alternative to a system of voting procedures as a means of preventing doublets in conferences that have been under study by the IATA Traffic Advisory Committee. One suggestion calls for the automatic extension of voting

Engineer Training Rules Due Jan. 1

General support for the FAA proposal was expressed by the Flight Engineers International Union, which the Air Line Pilots Assn. noted several objections. Air Transport Assn. officials are concerned on the grounds that the push-back device used thoroughly explained earlier in a meeting between airline associations and FAA Administrator Elwood R. Quisenberry.

Robert A. Benzel, head of EAA's Maintenance Agents and Schools Section, estimated that the proposal in Gaul form would be adopted by Jan. 1 and he indicated that hearings covering EAA approval of independent flight engineer schools will be held in the near future.

and beyond the one-run equations
 16. until such time as agreement can
 17. be reached in emergency sessions

This plan has been rejected as harmful, that some governments should oppose, water and fines for a period of more than one year. Furthermore, the committee felt that the proposed system might encourage some carriers to take a "negative position" on fines, charged if they felt that the status quo was in fact, reflected by simply diagnosing with an idea suggestion which was offered.

In its report to the assembly, the Traffic Advisory Committee warned against government interference in its role of licensing. Admitting that individual motorists hold the right to appeal or disprove conference decisions, the committee charged that some governments have, in the past made almost none which have caused difficulties.

They also seem to be a tendency on the part of some corner members to stress the need of government action things which they failed to obtain through conference mediation. On some occasions, government representatives have been inclined to give individual corner competitive advantages which were certainly not intended.

In this connection, the committee pointed out that it has not been established as to whether all South American countries are ready to take steps to secure a stable rate situation in their currencies. The committee found that some LATAC countries are adhering to VAT agreements in South America, but that the situation there is not wholly stable.

dated pseudocalls to maintain proficiency, would cover the same scope with a 50% emphasis on localities.

and are useful in powerplant modifications needed to keep the engines up to date. FAA and SAE/SAE training should provide 50% of the instruction for normal operating procedures and the balance for emergency procedures with an emphasis on crew coordination.

Approval of the individual program will be based on a personal inspection and acceptance of the course and facilities being provided. IAA will notify completion of the program whenever it fails to meet the IAA standards. Courses which fail to return all of the standards set by IAA will have a seven day period in which to correct the situation so that compliance of these was

Beginning Time

11.13. drives a woman's good morning tree of 180 lb. Don has been caught upon factors, and crime programs, which it mentions have proved adequate. The series also wants a basic manuscript of a three-act

These instruments were provided by the airline as a means of better securing the flight capsule with the alternating current electrical power system used on Airbus aircraft.

In *Lucas Films Arts* took the stand that pilots should receive equal towing rights—engineer duties from the company. ALPA has argued that pilot-rated maintenance checks currently performed by the flight crew(s) be conducted under the direct supervision of the pilot in command to address ALPA's belief that the airline should have the responsibility of defining the status of flight engineers, while the actual performance of the duty should be assigned at the discretion of the pilot.

GSA Asks Suspension Of Higher Coach Fares

Washington—General Services Administration has asked the Civil Aeronautics Board to suspend and rescind 1974 proposals of five major trunk airlines to increase certain long haul tariffs.

CSA changes the increased fare (AMT) kept 10, p. 47) would be "substantial, quantified and ascertainable." Because higher coach fares will affect that part of the traveling public which desires air, low cost air travel, CSA and higher fares would tend to "lower the already low load factors of the carrier."

Earlier this month, American Airlines, Continental Air Lines, Northwest Airlines, Trans World Airlines and United Air Lines filed with the Board its air coach fare increases.

Probe of United-Capital Routes Urged

Washington—Competitors of Capital Airlines are pressing the Civil Aeronautics Board to launch a broad investigation of the carrier's route structure which could effectively block its planned merger with United Air Lines.

Rejected by Embassy Through Warren during a prehearing conference on the subject, plans, a motion filed directly by the Board by Delta National Eastern and Northwest African seek to (a) condition any merger approval on a suspension and transfer of most of Capital's routes, to include a full-scale investigation of the airline's route structure and the airport's role.

Pumping out that CAA left intends to adhere to an expedited schedule in the case, which the two airlines must defend by Feb. 1, 2001. Board mem-

decided in Feb. 1, 1991. Board members told Americans West that they agreed to rule upon the motions in the "turn now" future. Timetable for the case will require an owner's hearing in the 18.

Boards of directors of both parent firms have approved the merger agreement, which will be presented to their stockholders Oct. 14.

Local Airlines Apply

In other matters, both Allghens Airlines and Mohawk Airlines asked us their current requests for entry capital points be included in the next entry case.

Capital and United filed a joint objection to these motions, pointing out that United considers Basic 53 total to be proposed savings and will not consider any agreement without the Capital points. Approving the motions would delay the negotiations and

New Ft. Worth Service Ordered

Washington—New American Airlines, with turbine-powered equipment, has been ordered to lease 117 Warthogs from New York and Washington to a Civil Aeronautics Board decision, which required the type of aircraft to be used and ordered the airline without a formal order.

CAB rejected the Ft. Worth Ad-
min. of Service Investigation, which
is dated Sept. 24, 1978, with a let-
ter that American and British Airways
are providing ample service between
the Texas city and New York and
Washington, and decided service should
not be improved. Airlines requests for
full federal backing were denied.

The Board ordered American to schedule one daily turboprop flight between Ft. Worth and New York, and a six turboprop flight between Ft. Worth and Washington. CAB said that American can readily meet the transportation needs of Ft. Worth by shifting one Boeing 727 and one Boeing 737 to the route.

important to "resolving the federal and state systems out of the Mississippi they said."

In addition, the two orders contend that there is no cause precedent for rejecting the nation that granting flows. They noted that the Board disallowed similar motions by Delta in its rejected Northeast-Capitol region and by United in its Blount-Mud-Contest region approved eight years ago. In each case, they said, the Board based its denial of motions on grounds that they would slash college funds and compromise the region's agricultural and forest products.

Bureau counsel of the CAB and that it faces an investigation of Capitalgate, makes a part of the strategy can become of the top of the qualified voters, which would have assets and operating revenues 15% greater than those of American Airlines currently, the largest benchmark. Giving the competitive support the wings could create. Board attorneys criticized the merged company would have revenues and assets four times those of Delta and Northwest and six times those of Na-

While recognizing that granting the process will require a new pre-hearing conference and other delaying procedures, business counsel said that there was some reason to doubt that failure of the board to meet the Feb. 3 deadline would result in Capitol and United dropping their merger plans or in Victor's foreclosure on Capitol.

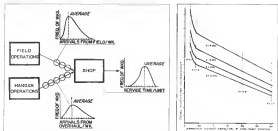
Light from Love (Dallas) to Castro Field
Fr. Wurff

These two positions are viewed here as departures from usual CMB practice. Authors argue that the Board, by "reducing production" can impose an "implicit" increase in service cost at will and under schedule changes that represent "current technology, even the 'best'."

America's Position

American contends that the whole record of a contested case must be brought up to date by formal hearing since additional service legally can be directed by the Board. For this reason, the value will position for CAB is consideration of the 1% Worth decision. If this is denied, American will challenge the decision in court.

CAB, on the other hand, explains that a "pure subject to the City of Washington" would craft a second non-binding hearing were held to see what was affected. Legislation



PRODUCTION PROBLEM encountered by a dealer when a sale is up short to several thousand or more of projected time, vehicle components is shown in drawing of left. As dealer in top and bottom left corners the problem of underestimating is noted. Two paths generated by debt and longer operation. Debt and longer operation. The dealer in top right corner is shown in a position to recover some vehicle sale with debt in right. From this position, the dealer may produce a turnaround, whether to recover against or credit out of consumers for gain. Graph at right shows the relationship between an additional dollar investment in additional inventory; vehicle head loss for a given vehicle (b), and the forecast change, average rate (c). In head loss, a downward and probability of stage is increased, total investment decreases. Thus each of the line representations covers more an infinite number of secondary stock level values for the reason:

Computers Reduce Airline Spares Stocks

By David H. Hoffman

Washington—U.S. industry worried by the soaring cost of spare parts and turning to automation is an effort to save fleet maintenance, which represents expenditures up to \$75 million for the fleet's repair.

In increasing numbers, the large carriers are adopting electronic competition and having streamlined parts control systems moved there. With reduced costs translating to consumers, more than two percent (65% share of online revenue), the computer-based marketplace.

Jobs for Computers

Speechless, computers are controlling the flow of separable components through entire overhead shops, which along the removal of prescribed time, parts on a first-come basis, preparing high-usage items and maintaining stable utilization in the field. Reports are transmitted by computers from the base of gyroscopes and from data related to, tripping in transducers inside some transverse shops are keeping management abreast of the overall parts situation within these systems.

An American Wire survey of the seven largest U.S. banks has disclosed that all are either programming or have completed advanced security sys-

feel welcome and that he is a member, contribute to this purpose. Here is the breakdown:

- **Aviation** Airlines expects delivery of its International Business Machines Corp. 707s complete in about 18 months. Although the computer manufacturer has not yet received the operational data processing Agreement, it thinks the likelihood is an agreement, control instrument. Should the plane acquisition, the airline intends to use the computer for its route and cost control.
- **Capital Airlines** now has a fleet-wide IBM computer to schedule overhaul of its time-shared engine, components and parts. The airline is currently working in experimenting with a punch-card system that ultimately will be used to record time and overhaul data dates for all airlines. A Remington Rand Unit will be used for maintenance and flight data for Capital.
- **Delta Air Lines** controls both production and reform stock levels of its major components with an IBM 670 installed in the airline's general offices. The computer was purchased because operational in February, 1978.
- **Eastern Air Lines** took delivery of an IBM 7670 computer last 12 will assign its passenger service accounting system. The 1.5 million dollar IBM 7670 is a 1.5 million dollar IBM 7670.

• **Capital Airlines** now uses a disk-based IBM computer to schedule sections of some time-critical cargo components. In conjunction with IBM, the airline is experimenting with a push-out system that ultimately will be used to narrow time and overhaul due dates for all vehicles. A Remington Rand Univac program reservation and flight data (in Cochrane).

*Delta Air Lines controls both passenger and freight stock levels of its table components with an IBM 670 installed in the carrier's general office in Atlanta. G4 Delta's system began operational in February, 1974.

• Eastern Air Lines took delivery of an IBM 7070 computer job. It will assign its passengers' names according to No. 1. In January 1961 the 7070 located in Eastern's Miami operations.

low, will be programmed for satellite production and operations control. The archive, also used at Unistar in New York, is, again, unique.

• **Pan American:** World Airways began controlling its Overseas Domestic program with an IBM computer last June. An IBM 650 in Miami keeps track of schedules and status of flights in Pan Am's Latin American Division.

• **Trans World Airlines** installed an IBM 650 computer at its Kansas City, Mo., overhaul base during June and July. First systemwide revenues, totaling over \$1 million for the computer on Sept. 2, TWA schedules overhaul of first control components with a close-up of Royal McNeil, LCP MD controller.

• **Control Air Lines** uses a battery of environmental IBM Electronic Accounting Machines to control the storage and retrieval of modules, intends to install a more advanced IBM computer with magnetic tape next year. Goals also over the past seven years, one pattern have been gaining control of scheduling and maintenance functions at United's San Francisco terminal base.

To discuss the magnitude of the variation and optimal control problems generated by path TO's, consider 5000 different vehicles, varying in

of them from its annual day. At the first of the line had 549 573,780 tickets, each of which cost \$2,000. Nearly 50 million

When furnished a detailed status matrix by geographic site position, route structure, major road and stock routes is predetermined by an electric

In allocating parts to with many, many openers first determined loadings scheduled to be during a time, spare cost loadings rather than, once first each planers had the part in at which it is likely to

The independent component approach to traffic at a station is a mathematical problem when the past's facts are applied. To improve the field, some stations capriciously deduced additional ways around the process of major maintenance the capacity for degradation on independent component and for its inspection.

Investigative Research

There is an overimplied example of the process:

The Lockheed 1049C and 1049H Super Constellations operated by on a firm, not Part N. Under a new fall schedule drafted by the carrier, 1049Cs will make 10 landings per week on the average at New York International Airport, while 1049Hs will make five. Both aircraft types have an estimated delivery

According to the survey's previous schedule, first players using Part X made 1,100 landings in total. Put this, in month of Part X during the ground war. 42. Thus Part X's total fallow, which was one, was 100 landings of 01 per

Forecast Rate

Using these fixed figures as parameters, Part V's forecast maps, rate of inflation

- For the 2040C: (+) (30) (01) equals 0.40
- For the 2040E: (+) (15) (04) equals 0.70

Thus total predicted usage at life
will be 0.56 units per week.

By applying one more track—the one it takes to reach Part X from its milestone source, to *latterid*—the crane can pinpoint track levels that are calculated to cruise not more than one mile, or 1 min, 2 min, 5 min, etc.

Repetition of the process for every possible post station combination would determine total costs, structure, and coating of the posts by type and quantity would determine overall investment required to guarantee the performance level achieved by the vehicle management.

Each sweeping schedule change, evaluated in an online poll for a semester, took shuffling of iterations. This holds true whether the change results in high-frequency types of equipment or both. The problem, however, is not in math moving the parts for the market into its own schedules—as it is determining where and in what quantity the parts should be moved.

EWA reports that 36 million under-
vertical steps of computation are re-

quired to process properly. After one major schedule change, Equating 10 to 12 man years of work under old character systems, this change can be accomplished by a high speed computer in about 5 hrs at a cost to the carrier of \$8,000 to \$10,000.

Unsurprisingly, for example, one solves the shortest path problem for 74 stations and 1,800 routes (740,000 permutations combinations) in less than 10 min. One certainly can compute and print out information on per-ride prices, check-in/check-out and baggage pricing data for a 1,000 line air network.

With huge sums invested in jet bridges, so increasing their emphasis on scheduling to board aircraft while that. Rapid changes come with increasing frequency. In some cases, space no longer is as plentiful as the popular round points. Thus the computerized control system that also monitors costs and, at the same time, increases the supplies available to spend on work maintenance, gives an entire independent within the industry.

What posteriori level on the shell components will afford at a particular station is far complex to derive. Use of the decision is marked by balancing various probabilities of output (such as 1 way 2 some 5 none etc.) with the cost of having and the cost of not having a part at a station.

Cost Considerations

Rational mathematics, the probability of savings is weighed against the cost of having an item available. A decision is based on the cost of having it plus the cost of not having it. To illustrate: one graduate with a known living wage might be checked at Section A where a prescribed number of booklets will tell



TRAIN leads visitors through stations of TTI's ranked list in Kennesaw, Ga. (left). On second day is a supercharger, one of 5,000 types of vehicles overhauled at government fleet yards in the south. Eastern on July 14 became the first server operator of a high speed IBM T370 computer (right). Computer will be used initially for emergency event monitoring in Miami.

phases. As engine components deteriorate or change in size every five years these engines would be studied.

With a probability stock savings from 20 to 30, this engine unit would be 9.3. At the cost of two new engines was \$300 and the cost of not having the generator was \$180, the cost side of the equation would be \$132—greater than the probability value. This large figure would warn the carrier that at least one generator must be stored at Station A to avoid economic penalty.

To the airline, the \$700 cost of not having the spare generator available is composed of a mixture of many factors, including the dollar loss when a plane shorted and its passengers must be transferred to a mid carrier's flight, the retraining costs on good will and return business and the cost of furnishing passengers with surface transportation should this elicit it.

Computers also play a major role in scheduling an airline's production of flights. When the problem is to determine the ordering and timing streams of boiler components coming from inspection stations and the final unit as it is ready for use.

Although input varies widely by port

to reach, output must be constant and recognized with the demand set by computer. Consequently, work areas within the overhaul shops must be defined from start to finish on pre-planned stock levels so that no stock is tied. Further complicating efficient use of plant and labor force is the fact that each stock requires its own number of run hours in its initial.

Computer Functions

By depicting these variables on a daily basis and by keeping constant track of inventory-wide activities, the computer actually informs decision makers they should work on next. The computer also can:

- Warn of each unit's approaching its time for overhaul as far in advance as the airline wants to be warned.
- Monitor the pre-time failure rate of each component, thus allowing engineers' attention on the need for design changes to certain parts. Because of the time lag built into clerical control systems, reliable parts that started to fail frequently often were not detected for months.
- Pinpoint the station or stations where stock levels have dropped to the danger level.

• Forecast parts requirements for a station which, when combined with other carrier forecasts, could lead to parts purchasing in certain areas.

At TWA, since subcontracting on its partables (those items that are discarded rather than repaired) is down from a company, TWA expedites however, are classified under three heading, each of which corresponds to the dollar cost of the items compared.

Class A includes 6% of the total expendable repair and the most cost items account for 55% of total expendable cost to the airline. Class B is about 50% of the items and 12% of the cost, while Class C totals 44% of the items and only 3% of the cost. Greater degree of control, obviously, is applied to Class A.

Besides telling TWA how parts and their type expenditures should be kept, the computer points out a "warning level" alert of stock depletion. TWA officials said it is to the appropriate vendor.

An ongoing signal results in a phone call or personal conference between TWA inventory control officials and the supplier.



Thrust Reversers on P&W Turbofan for Boeing 707-120B

Forward and aft thrust reversers are in operating position (reversing action also left) in the view of the Pratt & Whitney JT3D-2 turbo engine installed on an American Airlines Boeing 707-120B. Aircraft now has completed 53 hrs. of flight testing. The engine is then to be installed on a Boeing 720B medium range transport. In reverse, thrusts are totally is deflected forward to multiple across wing roots, area in the forward portion of the engine. Vortex are linked mechanically with the deflag cooling system. Two pipe cooling tubes are at interval channels down to the thrust reverser through the engine nacelle area. Company and the turbine does not need a small compressor since outside circulation of cold flow helps to cool hot exhaust with surface air, reducing mass



LUFTHANSA BOEING 707-420 jet transport is serviced by itself at Frankfurt/Main airport, the airline's jet transport base. Lufthansa scheduled its first jet service on the North Atlantic route Mar 17 following delivery of the first of five Boeing 707-420s on order. Two more of the same type went into service on the same route in April and May respectively. By the end of June this year, the West German airline owned and 350 transatlantic flights and logged a total of 2,514 hrs. flying time with the Boeing.

Boeing 707s Boost Lufthansa Revenues

By Edith Wallace

Cologne, Germany—Lufthansa West German Airlines reports a marked increase in operations in the first year of flight in the recent introduction of its first Boeing 707-420 jet service on the North Atlantic.

The company is happy to be a steady growth of its share in the market to help substantially in making a business case for itself.

Last year, despite overall improvement in the airline's traffic, the airline suffered a loss of about \$10 million, the largest deficit since its previous year's loss (AV Mar 25, 1959, p. 4). Even if the present financial result can be continued, it will take several years to recover the loss and become self-supporting. Losses from a fixed rate of aircraft for previous years, Lufthansa now has to at least an additional \$10-million every year for the next few years for the purchase of five Boeing 707-420 jet transport on order.

May Offset Loss

Lufthansa also has hopes of recovering some of its loss when the new agreement with Scandinavian Airlines (SA) is reached. The first joint venture agreement between the two countries expired Mar 31. New negotiations at the government level concerning the frequency with which Lufthansa may in the future lead in Scandinavian legs last December was threatened during the same time and an end was scheduled to be reached with this bill.

With delivery of its first Boeing 707-420 jet service in March, Lufthansa completed transatlantic service, jet flights to New York, Mar 17, its second and third Boeing jet transports on order were put into service on the

same route in April and May respectively. Up to the end of June, 10 jet hours carried on a total of 260 transatlantic flights and logged 2,514 hrs. flying time with the fleet. Boeing 707-420s in April the first and last month of operations with two aircraft of this type, the airline's average daily utilization rate was 9.91 in which by the end of June, but has increased to 12.71 by July.

In May Lufthansa extended its North Atlantic jet service via Montreal to San Francisco and the Pacific. With a traffic increase of 9% on this route alone during the first six months of this year, the West German airline has

made overall annual a total of 16 non-stop North Atlantic jet service operations.

In June, Lufthansa moved 104 passengers on seven jet flights to North America, thereby increasing the average number of passengers per flight per month to about 337. On the San Francisco round-trip aircraft operations introduced in May, the load factor was 50 percent, up from 48 percent in April. Lufthansa has stated that results with flights to Chicago are showing even better results.

Total traffic on Lufthansa's North Atlantic main network increased 63% this year from 45,774 in 1959.

Lufthansa Traffic, 1959 vs. 1960 First-Halves

	North Atlantic Traffic (million km miles)	Jan 1 - June 30 1959	Jan 1 - June 30 1960	Increase
Capacity available	8,575	30.3	42.0%	
Revenue passenger (one way)	513	18	42.0%	
Load factor (one way)	1.76	1.89	40%	
Mail (one way)	5.18	1.84	25%	
Total revenue (one way)	162	19.8	26%	
Flight (one way)	50.0%	40.2%		
Flight (one way)	2.63	7.1	124%	
Revenue (one way)	1.18	1.90	168%	
Load factor	32.1%	40.2%		

	North Atlantic Traffic (million km miles)	Jan 1 - June 30 1959	Jan 1 - June 30 1960	Increase
Capacity available	7,520	4.2	3%	
Revenue passenger (one way)	515	36.3	19%	
Load factor (one way)	1.40	1.44	37%	
Mail (one way)	2.21	2.14		
Total revenue (one way)	60.7%	37.4%		

	European Network and Other Germany (million km miles)	Jan 1 - June 30 1959	Jan 1 - June 30 1960	Increase
Capacity available	1,015	22.0	30%	
Revenue passenger (one way)	515	36.3	19%	
Load factor (one way)	1.41	1.40	100%	
Mail (one way)	1.80	8.4	180%	
Total revenue (one way)	4.24	11.23	197%	
Flight (one way)	49.1%	21.9%		
Flight (one way)	2.22	8.0	120%	
Revenue (one way)	1.07	2.14	100%	
Load factor	30%	44.7%		

ALL WE CAN OFFER THE AIR CARGO INDUSTRY IS A PRACTICAL WAY TO MAKE MONEY!



CANADAIR CAN PROVE TO YOU THAT:

YOUR piston powered passenger carrying aircraft now rendered obsolete by new equipment, and being considered for use in cargo operations, or already actually converted can be easily removed from fleet inventory and written down to zero book value in three years;

ONE THIRD the number of Canadair Forty Fours will carry out your cargo requirements at such a profit that they will absorb all expenses incurred in the replacement transaction, plus any earnings your piston engine aircraft would have realized during these three years;

AFTER THESE THREE YEARS, the Forty Four operating profit curve will climb steeply. The difference in profit potential for the following years is substantial.

CANADAIR LIMITED, MONTREAL, CANADIAN SUBSIDIARY OF GENERAL DYNAMICS

Any consideration of a specific example requires certain assumptions regarding scheduling, future rates, and load factors, but, under a representative set of conditions our analysis indicates—that a fleet of 25 piston powered aircraft currently being converted into cargo carriers, could be replaced and retired by a fleet of 8 Forty Fours. The above assumptions and statements are based on the arbitrary premise that cargo rates will remain at present levels. If they are reduced, as seems inevitable, the situation will favor the Forty Four even more strongly.

THE FORTY FOUR. The Canadair Forty Four, with its combination of low direct operating costs, high block speeds and large payload capacity, is the world's most economical cargo aircraft. Delivery schedules can be arranged to introduce the Forty Four into airline service fourteen months from contract agreement.



Halifax Opens International Airport

Partially flooded by full service of a Trans-Canada Air Lines Douglas DC-8 jet transport at the 1,250 ft long terminal building at the new \$10 million Halifax International Airport, freight opened earlier this month. Airport has two runways one 5,500 ft long and another 7,700 ft long, and is located about 25 mi. northwest of the Nova Scotia capital city.

to 77,931 during the first six months this year.

Improvements in the frequencies of Lufthansa's European short- and medium-range flights as well as the introduction of more direct flights within West Germany during recent months have also contributed appreciably to the present favorable trend.

Cargo Capacity

With delivery this summer of two of the carrier's four Lockheed Super Constellation 150A aircraft converted into cargo-only carriers (AW Aug. 1, p. 49), Lufthansa has boosted its freight-carrying capacity on the North Atlantic route by about double its former strength. The two airplanes have won, yet only service at the beginning of August on a stopover Frankfurt/Altenrhein, Zurich for five times weekly, both ways.

The airline also reports good results in its charter service, which has become increasingly popular. During the first half of this year compared with the same period in 1959, demand rose by 214%.

A comparison of Lufthansa's overall results for the first half of last and this year shows that capacity has increased from 61 million to 95.6 million ton miles or by 49% and demand from 29.4 million to 47.2 million ton miles or by 60%. The load factor during the same period rose from 49% to 59% in 1959 and of June 30 this year.

France May Produce Rolls-Royce Tynes

Paris-Rolls-Royce and France's Hispano-Suiza have arrived at an agreement covering joint production of the Tynco turboprop.

The agreement has been pending for some time. It is expected that Hispano-Suiza's initial role will involve an assembly work on the Tynco using drawings supplied by Rolls-Royce. Later, drawing expertise deemed necessary, the French engine builder will launch a second production source for the Tynco.

Agreement between the British and French companies is aimed at meeting the present demand requirements of two co-operative European packages. One is the joint Franco-German Transall C-161 transport project. The other is the Argent 1190 Atlantic 55W aircraft being developed to meet a NATO requirement.

Rolls-Royce engines are expected to use the Tynco. No final production order has yet been placed for either aircraft under the package as still being built.

It is expected, however, that the two packages will involve between 200-400 aircraft.

The Rolls-Royce license deal with Hispano-Suiza covers a joint business agreement between the two companies. The

French firm earlier built considerable numbers of the Rolls-Royce New and Tin turboprops under license. French companies raise engine work at present is concentrated on overhauled contracts, as well as production of SEPR rocket booster engines for the Mirage III. Hispano-Suiza also is engaged in producing Landing gear units for the Conquille and other aircraft.

Communist Red Carpet

Moscow—In Russia's chaotic society, air travelers who take jet transports from Sverdlovsk to the Chinese are now at least of being put a bit closer than they consider who have in justice, personal security.

Communist has opened a special airport section in the air terminal for jet passengers, who also go through a special gate to their aircraft. On arriving at the Sverdlovsk Airport from Yalta or some other nearby airport by helicopter, jet travelers can get their tickets, check their baggage and be seated in their aircraft in a matter of three to five minutes according to the magazine *Crash* (Moscow). Arriving off, presumably without riding shoulder with the pilot.

The Chinese is a favorite section of interest for high Soviet officials, and it has frequent meeting jet services to Moscow.

Self-sustained transport

at work in the Congo



**U.S. Air Force
Lockheed C-130
Hercules**

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Airline Income & Expenses—July, 1960

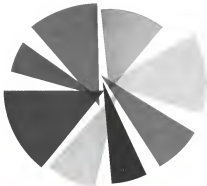
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	Passenger Revenue	W & Mail	Express	Freight	Charters	Total Operating Revenue	Total Operating Expenses	Net Income Before Taxes
DOMESTIC TRUNK								
American	24,404,120	220	373,450	1,798,198		\$24,805,988	\$4,779,948	\$1,906,040
TransPac	4,561,689	198,128	70,143	123,176	71,369	4,853,465	\$6,722,733	\$738,647
United	9,248,412	24,408	202,198	20,143	6,845,956	9,281,017	9,281,017	\$83,481
(Continental)	4,843,698	82,000	23,000	103,000	31,300	2,878,500	2,865,882	\$86,618
Delta	1,116,000	143,000	199,000	293,000	47,000	6,957,000	7,100,000	\$143,000
Northwest	20,253,547	262,724	884,079	4,738	6,738	20,995,447	22,307,743	\$1,309,194
Eastern	4,168,481	81,748	34,402	147,146	120,428	5,166,365	5,796,974	\$264,481
Northwest	3,173,479	42,587	15,161	19,734	7,277	3,348,250	3,772,633	\$468,379
United	1,102,164	218	\$34,841*			1,102,164	1,102,164	\$19,319
Trans World	24,199,740	474,349	1,271,000*		140,453	25,945,199	26,498,482	\$3,379,341
(United)	29,721,642	723,344	\$1,163,480*		233,159	30,638,577	30,797,444	\$1,445,719
Western	5,484,749	158,436	381,573		44,143	6,065,461	5,297,508	\$767,953
INTERNATIONAL								
American	594,995	9,454	308	43,347		\$614,804	\$9,454	\$73,444
TransPac	1,282,144	23,875	12,487*	63,441		1,381,948	1,878,549	\$17,545
Continental & Atlantic	128,142	3,412			1,833	308,760	341,261	\$73,444
Delta	4,099,499	4,099		8,000		4,107,598	4,107,598	\$1,000
Northwest	2,741,268	28,719	133,170*	3,444	34,123*	5,521,488	5,848,282	\$879,180
Eastern	161,191		499	2,444		163,134	161,191	12,943
United	124,123	4,233		1,714		129,070	124,123	\$4,947
Trans World	3,484,238	220,320	367,703*		51,502	5,483,563	5,257,719	\$730,181
Pan American	31,477,000	1,772,000		3,483,000	861,000	46,463,000	46,463,000	\$3,483,000
Atlantic	138,000	15,000				153,000	153,000	\$15,000
United	1,101,600	656,600		1,406,600	497,000	2,805,800	14,748,240	\$1,442,000
Delta & American	7,713,000	218,000		1,126,000	73,000	9,056,000	10,199,000	\$897,000
Pacific	5,248,000	491,000		897,000	67,000	6,703,000	7,548,000	\$2,648,000
Panagra	1,901,000	94,800		299,000	7,000	2,207,800	1,897,000	\$310,800
Eastern					8,000	8,000	31,224	\$27,224
Trans Continental	719,812		\$4,244*		35,312	804,368	814,712	\$12,344
Trans World	10,108,700	246,123	642,000*		569,218	12,216,041	6,763,761	\$3,448,280
United	2,105,464	47,427	33,491*		21,763	2,187,145	3,666,161	\$1,444,216
Western	2,467,000	5,441	18,391*		35,173	2,516,005	2,597,464	\$441
LOCAL SERVICE								
American	933,197	10,720	18,000	24,348	1,158*	1,026,403	1,079,739	\$19,664
Continental	247,618	3,358	2,375	6,749	32,819	290,919	301,202	\$45,681
TransPac	21,348	7,994	3,371	8,000	319	35,032	400,167	\$1,766
Continental	626,320	12,444	4,232	17,221	14,344	670,561	1,132,216	\$47,655
United Continental								
Northwest	447,390	11,823	12,200	16,351	31,414	1,108,978	1,193,000	\$44,022
United	1,161,372	29,420	23,000	22,271	8,800*	1,244,863	1,274,412	\$1,451
Southwest	874,848	15,639	11,414	17,364	8,167	1,007,399	1,048,790	\$18,408
Pacific	200,000	18,944	6,212	40,718		259,934	327,847	\$46,881
United	456,436	9,744	15,445	15,445		537,070	537,070	\$12,589
Eastern	110,374	2,431	1,270	2,344		114,419	117,754	\$39,111
Trans World	102,832	12,942	2,286	16,209	2,470	176,120	179,994	\$3,871
West Coast	568,808	9,732	11,475	11,475	3,703	595,493	544,889	\$45,604
NON-UNITED LINES								
Alaska								
Marathon	719,007	5,132		18,429	207,021	1,022,146	676,116	\$332,321
CANADIAN LINES								
AIR CANADA								
American-Bud American		7,480	1,260,350*	148,737*	113,244	979,810	971,480	\$16,330
Flagship						2,615,738	2,615,738	\$0
Island						623,277	270,440	\$129,844
Continental & Western*						87,909	306,676	\$118,767
EUROPEAN LINES								
Chicago-Washington	171,434	165,698				337,132	306,776	\$30,356
New York-Los Angeles	26,240	12,770	5,212*			381,281	143,840	\$237,441
San Francisco-Los Angeles	100,179	5,768	3,940	9,433		149,316	99,550	\$49,766
ALASKA LINES								
Alaska Airlines	334,274	31,099	1,719	44,347	226,149	736,589	665,885	\$70,704
Alaska Airlines	339,223	9,283	10,103	10,103	4,472	363,611	350,990	\$46,621
Continental	31,848	7,267		40,512	103,499	174,628	158,638	\$15,990
Alaska	87,123	2,283	8,000*		424	126,349	123,076	\$3,273
Continental	134,104	26,344		34,661	35,541	230,050	197,416	\$32,634
Pacific Northwest	844,129	47,723	2,378	102,311	2,629	1,166,160	1,253,180	\$14,980
Trans World								
Alaska Airlines								
Western Airlines*								
Alaska Airlines	281,263	47,780		49,446	77,787	408,776	476,476	\$0
ALASKA AIR TRANSPORT								

¹ Not available. ² Property figure. ³ Non-scheduled transportation or other transportation. ⁴ Not spreading profit or loss. ⁵ Com-

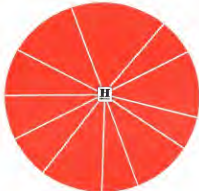
⁶ Expenses & income language. ⁷ New transport resources—no operations in July. ⁸ Freight & excess language. ⁹ Mis-

¹⁰ See Midland Finance. ¹¹ Detailed in Relation Week-end airline assets in the third Management Board.



YOUR DATA SYSTEM—HYBRID OR

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AIRLINE OBSERVER

■ RFA between the Air Line Pilots Assn. and the Air Line Stewards and Stewardesses Assn. has opened a new showdown season. The International Guild of Flight Attendants, RFA, too in its organizational purview. But while it has been encouraged by several large international unions, it is independent and not affiliated with any of them. The new union and it got organizational advice from Transport Workers Union, United Auto Workers, International Assn. of Machinists and International Brotherhood of Teachers.

■ Titled Aviation Agency's regulatory powers may get a thorough overhauled next year if Sen. John Kennedy (D-Mass.) is elected. President Air Line Pilots Assn. and other groups which have objected to Administrator Howard B. Callender's authority would certainly support Kennedy's law work law since to heart this power. In a letter to ALPA, Sen. Kennedy indicated he would support the reinstatement of legislation by Sen. Clay Eagle (D-Calif.) granting the Civil Aeronautics Board the authority to review any FAA regulations which the Board considers not in the public interest.

■ James C. Berton, acting director of National Capital Airport for the Federal Aviation Agency, will be replaced by Ward Hobbs, former Capital Airlines vice president who also has 25 years experience with American Airlines. Hobbs' appointment is pending the action of FAA Administrator Howard Callender since a time of the Soviet Union. Berton has been named director of aviation for Ft. Worth, Tex.

■ Air Line Pilots Assn. negotiators with union local unions indicate they face a tougher management attitude as a result of the stand taken by Southwest Airlines which has succeeded in achieving a high percentage of success despite a nearly four-month-long pilot strike. Availability of unemployed pilots to various agencies, plus ALPA's inability to call threatened sympathy strike by pilots at other airlines, is increasing management optimism. Little trouble was in future pilot-management talks would probably be encountered in the predominantly unionized sector.

■ Domestic mainline traffic totaling 14.8 billion revenue passenger miles in the past eight months produced a 6.3% gain over the same period last year, despite a 4.5 percent drop in load factor during August. Carrying capacity a 68% load factor this August, compared with 66.4% for the same month in 1978. Coach service accounted for 54.5% of the August revenue passenger miles, compared with 48.8% in August, 1978.

■ Export Import Bank has agreed to loan totaling \$20 million to Air India and South Africa Airways for the purchase of Boeing 707 turboprop transports. SAA is buying three 707s at a total cost of \$16 million on an installment loan of \$10 million. Air India is buying one turboprop on an installment loan of \$4.1 million.

■ Air France has sold one of its Lockheed L749A Constellation to the French Air Force for use as a surveillance aircraft and search aircraft. The aircraft has been modified for the government by the airline.

■ Northwest Airlines' Boeing 787 dash model trip between Miami and New York generated more than \$2.5 million in gross revenue to profits while the company DC-68 buses on the same route during the first half of 1980. The single turboprop aircraft earned about \$1 million more in this period than Northwest's 11 DC-10s, even though the turbo engine aircraft logged 35 times as many scheduled hours.

■ Trans World Airlines estimates that it will be overhauling Pratt & Whitney JT3 engines at the rate of one a day within the next two months at its Kansas City maintenance base. Overhaul work on the Boeing 707 powerplants was formerly done at Birmingham, Conn., under a contract with P&W.

■ Eastern Air Lines is continuing to shift its emphasis from flight frequencies to improved customer services. Latest program concerns, upon receiving public suggestions for schedule schedules and improving night food service.

SHORTLINES

■ Braniff Airways and Gibson Refractory after Division, Hopp Corp., have signed a contract under which Braniff will fly 7,000 to 8,000 Gibson appliance dealers to the company's 1981 convention in Phoenix City. Braniff will use its Boeing 707-327 turboprop aircraft to make more than 30 flights from 21 U.S. cities. Pan American World Airways flew this year's convention delegates to Kansas (AW Sept. 13, p. 51).

■ Confidential Air Lines has been ordered by the Civil Aeronautics Board to continue serving Los Angeles on flights originating at Chicago and not leaving to Kansas City and Denver. Commercial had petitioned the Board for permission to terminate one daily flight on this route at Denver or Colorado Springs, claiming termination of the flight at Los Angeles is inconsistent with Vickers-Venue and Douglas DC7B aircraft due to competing non-stop turboprop service from Denver to Los Angeles.

■ Civil Aeronautics Board has dismissed a complaint by United Air Lines against 15 day first class excursion fares offered between Kansas and Portland-Seattle by Northwest Airlines. United charged the fare on the Honolulu-Seattle/Port land segment was unreasonable and there is no need for reduced fare plans owing to the "beneficial public response" to turbine flights on the route.

■ Northwest Airlines and The Gold Bond Stamp Co. have signed an agreement whereby travelers can fly on Northwest's routes to Florida, Alaska, Hawaii and the Orient by presenting Gold Bond trading stamps to Northwest for air transportation and fares.

■ Pan American World Airways will open a new sales office in the Grand Hotel in Warsaw, Poland. Part of the office will be to provide information on Pan Am routes, and passengers whose fares have been prepaid in the U.S. and work closely with LOT, the Polish state airline, which connects with cities in Europe served by Pan Am.

■ Trans Caribbean Airways reports that in the first half of 1980 it had 100 more carried away passengers than it did in the entire year of 1978. The company predicts it will fly 125,000 passengers more than 100 million passenger miles by the end of 1980. Winter schedules call for 60 weekly round-trip trips to the Caribbean area.



Plane, Train or Limousine?

(none of these, this is a helicopter)

Looks like a conference room, doesn't it? Well, it is as a way. The cabin of this new turbine-powered Sikorsky S-62 was designed by Raymond Loewy to make every trip conducive to meetings, study, work and even rest.

The turboprop engine not only contributes to this atmosphere with its smooth, quiet operation but also has an unequalled record of reliability to recommend it. And because the mechanical complexity of the S-62 has been proven in over 1,000,000 hours of flight, periods between overhauls are four to five times longer than would normally be expected of new developments.

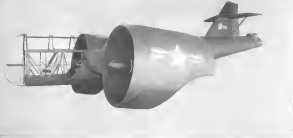
This nine-passenger, boat-bulld Sikorsky S-62 is the new-

est addition to the family of helicopters you so often see in the news transporting government dignitaries both here and abroad. As it does for them, a Sikorsky helicopter will cut your executives' traveling time considerably.

So today, get a note to Sikorsky Aircraft on your letterhead and a representative will call to show how your company can gain in business, in time, in executive power and in prestige with a new Sikorsky S-62 executive helicopter.



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SIKORSKY AIRCRAFT
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BACKUP of ring-wing aircraft was built at Piasecki to demonstrate general appearance of a typical test vehicle. Reaction-control nozzles at tail/tail is circled fuselage tail cone.



WIND-TUNNEL MODEL configuration shows appearance of ring-wing configuration as a conventional high-speed aircraft, rather than test or development thing. Mid-loading gear is mounted at bottom of ring wings. Main flap and control flap are, deflected in place below of Piasecki's ring-wing model. Various set-ups in flap for landing condition, or as flow direction in addition to providing lateral control. Circular view on not entitled here.



Piasecki

By David A. Anderson

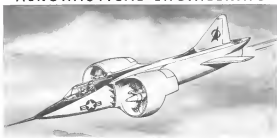
Philadelphia—Ring-wing VTOL concept, which combines propellers and lift in a single, regular unit, has been developed, tested and patented by Piasecki Aircraft Corp.

Concept is built around a shrouded propeller, which produces thrust or is turned efficiency compared with a free propeller. But the shroud has been extended partially into a cylindrical surface with truncated trailing edge. The portion with the longer chord is used as a lifting surface.

Original idea for the ring-wing was developed by Zbigniew M. Cielinski, the company's former chief of design and analysis. Yet engineering built around of Cielinski, D. N. Morton, J. J. Morsell and E. N. Piasecki developed the ring-wing concept. Cielinski died before the test, and Piasecki, himself was the manager for project right.

Design and test data from the five-year development program on currently is final report stage. Next step planned by the company is to apply the principle to a full-scale ring-wing test vehicle. Piasecki has previously set along these lines and is hoping for a follow-on contract to carry work into the ring hardware phase.

Development and test work on the design, including ground tests of the propulsion lift and wind-tunnel tests of a complete model configuration,



HIGH-SPEED FIGHTER proposal offering ring-wing principle is one application suggested by Piasecki. Indications are that plane could reach speeds as much as Mach 3 without flow problems in the ring-wing.

Tests Ring-Wing VTOL Design Concept

was financed by the U. S. Navy's Bureau of Aeronautics in a contract awarded to the company in July 1956. Since then, the basic idea has been evolved and refined to develop as a jet that fits somewhere between the speed ranges of the helicopter and the jet transport.

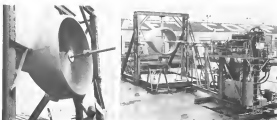
Frank Piasecki says that the ring-wing is now intended to make the helicopter

shaded, but to do design the helicopter can't do. As an example he cites a high-speed VTOL fighter along the lines of a light tactical support weapon system.

Eventually the ring-wing will be compared with other VTOL concepts, including subsonic ducted fans, such as the Duct design, the ducted fanjet such as the French Sirocco Concept

or the ducted fanjet also exemplified by Lippert's Aerobee. The ring-wing differs from all of these others in that water would have been involved a jet that integrates propellers and reaction—and, again, according to Piasecki, doesn't try to do what this are doing.

Actually, as regards the ring-wing started idea as a simple propeller with a periph-



SHOCK-FLOW STUDIES were part of state ground tests made with single ring-wing scale in test stand at Piasecki plant. Turbomachinery under pressure shown right in left photo in various locations around still to get visual and qualitative check of flow conditions at zero forward speed. Ring-wing test stand at Piasecki plant (right) shows conditions in steel frame suspended at each corner by shrink-grip mounts. Piezoelectric at right is connected through long extension shaft to propeller shaft of ring-wing. Water power stand can be swung around pivot at its base (lower right) to hold when on re-adjustment needed frame.

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end ahead to increase its efficiency. Use of the closed diameter the dip stream directed behind the plane of a free propeller and increases the static thrust available.

The result is that as speed increases the drag of the closed streamlines also and the thrust less efficiency come speedily.

One Approach

One way to adopt a simple propeller closed construction for VTOL and to bring a series of cascade flaps behind it to turn the flow through the greater part of 90 deg and produce a large lateral component due to deflected thrust. But this approach, which looks simple and is logical, is not optimum. Thrust losses and drag are higher than desired.

Confuse yourself that if the wing showed not going to produce drag anyway, it might be desirable to extend the

chord far enough to make it provide lift as well. This was the closed wing over built as a lifting surface and as a means of increasing the thrust of the propeller. Closed diameters could be chosen to suit the amount of lift needed.

Next step in the evolution was to add the trailing vane in cascade behind the stream. But this produces two drag penalties: the distance between the zero diameter center of the wing and the first vane is increased which produces a destabilizing pitching moment and the lower portion of the dipstream is forced too close to the chord so that the vane has to be deflected further aft making for increased pitching moment and aggravating the weight and balance problem.

There is one fundamental advantage the drag situation is improved because a single root produces the positive drag of either a stream or a wing of the same



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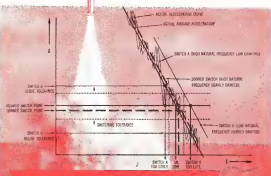
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880-M Wing Slots Tested in Dynamics Laboratory

Wallofins attached to extended leading edge slots on Convair 440-M are connected by a 1/2-inch core to variable angle fences as designed by Douglas test laboratory. Six Days Rock wing half has two slots between the engine ports and two outboard of each outboard slot, they have 44 deg span for shorter leading than the 530

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switched area, but it functions almost naturally as both.

The last step in development of the wing-wing concept was stated at the beginning of the development and keeping the advantages. All the lifting surface was added at the top of the chord and the lower segments of the chord were cut to the minimum chord necessary for its proper function as a chord.

Leading edge of the wing-wing was angled forward and downward to make the transition between the upper lifting surface and the lower chord. This reduced the distance between main, nose section and thrust vector reducing the destabilizing moment forces down and it tapered the cut condition for the lower portion of the segment.

Control Surfaces

In this three design for a combined lift and thrust unit, Colburn added horizontal and vertical flaps to the chord plan flap elements on both upper and lower sections. Flaps can be used as deflection aids in leading edge or as lateral controls.

Further refinement of the unit came from an analysis that added at the leading edge of the wing-wing to prevent flow separation at low or zero forward speed.

Flare still means the problem of pitching moment during transition. Even though this has been reduced to a minimum by the shaping of the wing-wing it still has to be countered. Colburn proposed that the chord from the gas turbine driving the propellers be used to provide reaction control which would counter the destabilizing moment.

The patent also suggested the possibility of using a differential system in the lower chord to increase the yawward therefore the static thrust of the deflected system. It also mentions the reduced noise level of a shrouded propeller.

Typical Unit

Putting all these components into a single engine unit would be a task of an engineering magnitude, but in practice—very small. In the simplified test unit built at Princeton it isn't that at all.

Start with the wing-wing still in upper configuration of large chord to lift at a wing, and the lower portion cut back to discard flaps. Mount a single vertical stabilizer and a single horizontal stabilizer both with leading edges about at the trailing edge of the chord. At the intersection of the struts mount the counterweight propeller drive shaft and gear box. Attach brags and actuators at the leading edge of the horizontal stabilizer to hold and operate the two main flaps and the

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THE COLUMBUS DIVISION OF NORTH AMERICAN AVIATION, INC.

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code vices. Flaps and vices retract into a single fixed aerodynamic surface, extending aft from the outer leading edge.

Add deflector flaps to the lower segment of the chord, to increase the effective area—and therefore the static thrust—of the deflector. Install a planar flap on the leading edge of the upper segment to act as a combined flow deflector, leading flap and aileron.

Mount a wing-shaped curved guide vane to the end of the wing wing to eliminate flow separation at low forward speed, and the leading edge of the wing wing is completed. Two or more of these units, mounted directly to a bearing, serve to provide lift and guidance to the aircraft.

Aircraft Layout

One proposed vehicle was built as detailed model form and tested to the Navy's David Taylor Model Basin wind tunnel. A pair of wing wings mounted close to the conventional leading edge. The tail cone was extended to simulate the nozzle through which is burnt gas from the turbojet is blasted to counter the deceleration pressure during transition. In the model there was no flow through this duct.

Reference area for calculating aerodynamic coefficients was arbitrarily chosen at the area of two elliptical wings, each having a span equal to the wing wing span and a maximum chord equal to the average chord of the wing wing.

The model was obviously a test vehicle to prove the concept of the wing wing. Patent drawings show a low wing wing configuration planned as a transport. Another Patents drawings show a highspeed VTOL fighter.

An aerial fighter mission is the operation of all three proposals in that the tail is rotated to a low position, while the aircraft is still on the ground, and before going into the vertical lift stage. This is done to enter the thrust vector to a vertical position, without permission the aircraft becomes an VTOL performer.

Operational Procedures

Typical operational procedure for any of these vehicles would be to land with the aircraft in its normal three-point attitude. Pilot would complete their check lists, start the engines and then direct—manually with a control stick—control—some of the relevant through the rear nozzle. The reaction would tilt the aircraft to the tail-down ground angle necessary for vertical take-off.

All the aids to control flight—control vanes, vanes, deflector flaps, and deflector flaps and aileron flaps—would then be extended, and the pilot would raise the engines up to full power using a

low-pitch position on the propellers. By increasing the propeller collective pitch, the vertical velocity is built up and the aircraft lifts off the ground.

The pilot starts transition at altitude by pitching the airplane forward to the static ground level attitude. The tilt of the tail down vector forward on the horizontal component of thrust starts to accelerate the aircraft forward. At some predetermined speed, the cascade vanes are fully retracted, which allows the upper portion of the deflector to flow directly aft instead of turning. As the speed increases further, the main deflector and aileron flaps are slowly retracted and the aircraft continues to accelerate to design speed.

The same procedure in reverse is applied to the vertical landing phase.

In addition to building a detailed model of a proposed vehicle and testing the scale model of another vehicle in the Navy's model tunnel, Patents drawings show a built test stand to drive a full-scale wing wing for static tests of the various under operating conditions.

This test stand is a multi-purpose wing built to test the response of the whole vehicle, in static, referred flight tests of any VTOL vehicle of reasonable size and to check the zero-sum performance of the wing wing and.

The lower segment of the wing wing is hinged on strain gages so that the entire lower system can be retracted during tests just as with a multi-component wind tunnel balance system. Propeller of the wing wing unit is driven by an enclosed drive shaft from the test stand propeller.

Wings Mated

Patents' problem now is where to go with the wing wing design. Current status is that design and development work has gone about as far as possible without constructing an operational vehicle. Work is still being done refining and improving test stand. The company has high hopes for follow on aircraft which will enable it to get something in the air.

In times past, Patents' personal philosophy has been to do something to get something built and tested to get something in the air.

Right now the company efforts are concentrated on getting the second Sky-Cat completed and flying, and in working on the various subcontracts that are helping the machine shape itself. But people in the industry who know Patents are willing to bet that sometime, before too long, he'll be coming out of the nose section of a wing wing landing aircraft, whose under wings should be in position, to make the first flight tests of the wing wing VTOL aircraft.



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Short SC.1 VTOL Makes Transition at Farnborough

Long-stroke landing gear of SC.1 was designed to absorb energy of 15 ft/s descent from hovering configuration. Plane was shown tested at Farnborough from this platform, under transition from vertical to forward flight and back again.



Delta wing layout of SC.1 was chosen as compromise between well-tested geometry and possible plan for future VTOL vehicle using jet lift. First lift engines are suggested to supply propulsive engine. First low auto-rotating system in pilot seat at low speeds; fuel to reaction control system utilizing high pressure air bled from the lift engines. Rules, SC.1 tests an aircraft running at Farnborough under power from its single RB.108 propulsive engine. Collapsing forewing and ailerons protect lift engine when forward-facing flaps at intake gull are gull to provide increased air supply for no start of the lift engines during wing house flight.





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PRODUCTION BRIEFING

Evolution models of a 10-lb valve oscillator developed by Chas. Vinicki Electronics Division will be supplied to the Navy. Dollar value of the contract is not disclosed. System occupies less than one cubic foot of space and is adaptable to existing aircraft land or shipboard radar, the company notes.

Valve oscillator and rectification performance models will be produced for the U. S. Marines by Long-Tower Electronics Delta, Inc. under a \$450,000 contract. Both items will supply Marine radio equipment and data, the manufacturer notes this week.

Allison turboprop powered Comac motor, largest has been delivered to Ford Motor Co. following installation of an engine interior. Space integrated instrument system Spem 5-17 assembled and tested the approach system wiring for a transport in installation of additional fuel capacity and instrument panel changes, which was done by Allison's Western Division of Garrett Corp., Los Angeles.

US glide slope receiver, using 5075 is a production at National Aero Switch Corp. (NASC) at its Ft. Washington, Pa., facility for Inconn and pre-flight aircraft. Designated UGR-1, the unit weighs 6.75 lb with shock mount and measures 1 in. x 5 in. x 10 in. Type incorporated under G-14 Category B, the UGR-1 can operate from any 100-ohm glide slope antenna. Unit utilizes "internal tubes" elimination and for separate power supply. With 23 channel capacity, it includes automatic to the proper UHF glide slope frequency when the lander in queries of the Navy MIL V or 100A components are tied to it.

Given output back and product analog system for a distance about aircraft circuit will be produced by Anzalone Associates, Rahway, N.J., under a \$300,000 Navy contract. System delivers beyond the November.

Kellett Aircraft Corp., Wilton, Conn., is a producer, finishing and aircraft for the ground support in aircraft operations under a contract awarded by General Electric Corp. in connection with U. S. Army Ordnance requirement for a type of landing track for positioning and slipping nose cones on carrier.

General Electric's CE-10 turboprop engine completed its second flight on 193 hr continuous run in less than a month.

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For technical data on the Cherrylock Team of rivets, write Cherry Rivet Division, Townsend Company, Box 2337-N, Santa Ana, Calif.

*Patent No. 2,913,032

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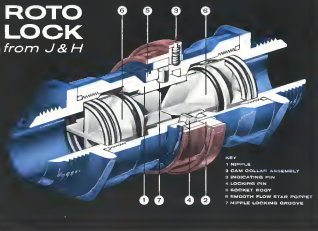
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Adaptability to need—will handle any fluids from air through exotic fuels; can be made in wide range of materials, including plastics, easily adaptable to special requirements.

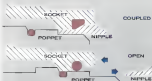
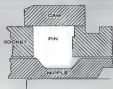
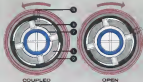
How these improvements are provided by ROTO LOCK is shown on this page. Specific application data and performance analyses are available on request. Sizes and designs available for immediate application are listed on next page.

LOCKING PING KEY TO PRESSURE CAPABILITY, LONG SERVICE LIFE. Locking pins can be seen in the cutaway and the two top illustrations. This design provides a maximum contact of pin, nipple groove, socket body and cam. Net result is an optimum load distribution... high-pressure capability. This balanced distribution also virtually eliminates "Burr-fitting"—prime cause of conventional coupling failure...accounting for ROTO LOCK's long service life. The mechanical advantage of the cam and chamfered mating surfaces pull the nipple into tight lock.

INDICATING MECHANISM GIVES 3-WAY SIGNAL OF COUPLING CONDITION. The indicating mechanism, top right, is a simple, spring-loaded pin. At "open", this pin projects above the cam collar. As collar is rotated to "coupled", pin rides socket body until it finds and seats firmly within flat-bottom hole in nipple body. At this point, coupling is completely locked, pin is flush with collar surface. As the pin seats, a definite click is heard providing a visible and sensory signal of coupled condition.

"STAR" POPPETS REDUCE PRESSURE DROP. Cutaway reveals unusual poppet configuration which results in maximum freedom of fluid flow, shown right. ROTO LOCK pressure drop is considerably less than military specifications. To disconnect portion, positive self-sealing action is assured by heavy stainless springs and "O" rings recessed in the poppet. ROTO LOCK can be supplied with poppets in both socket and nipple, in socket only, or nipple only.

SIMPLIFIED SEALING HOLDS PRESSURE OR VACUUM. Line drawings, bottom right, show condition of seals during connect and disconnect. This simplified seal construction is so effective that safety or secondary "O" ring or face seals are unnecessary. Note that sloping surfaces of the nipple body provides an escape-pool location for nipple-socket seal, enabling it to seal with equal effectiveness against very high pressures or vacuums. Note also that the location is remote from damage during connection.



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The F. A. Howe Co., Lorain, Ohio 44130, supplies silver and material for construction at the Oak Ridge Y-12 Plant Research Facility (United Nations at Y-12) (Oak Ridge, Tenn.).

The Ridge West Co. designs, manufactures, fabricates and installs the safety signs and erection of mounting steel for the Alternate Erection Test Facility at Plum Brook.

Cumulative Filter and Regeneration Co., Inc., Division A-1—817 996—2011-16 and 2011-17 to Columbia Machine and Tool Co. and 1704 Van Ness Blvd.

Consolidated Vacuum Corp., Rochester

4. *Veronica* spp.—Various species and associated equipment (all definition changes apply)

Wiley InterScience, Inc., New York, NY
Fisher Company, Boston, Mass. 02110
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CR-441, 1981

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lens, film, etc.)—\$100 or less—Various parts and
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Two Ohio-Florida-South Korea labor and material in hotel contract and low cost. More with construction means for the 10.

The Father-Child Center, Inc., through its child-care staff, serves, before and after

[illegible]

Western Undergraduate Law Association (WULA)
\$25,000—45-minute computerized database

The K. Moore Co., Cleveland, Ohio, 47170—Supplier and contractor for all projects in the Atlantic Wind Tunnel Test

[illegible]

1940—1941—North Carolina, South Carolina, and Virginia.

Work Service Allen Springs, Md.—441

218—The white limestone structure stands in
middle of river in creek of Plum Brook

Bomarc Gets Checkout

Boscow IM-98A. Boscow interceptor vehicles are now based up at the assembly and maintenance hangar (below) for checkout, including simulated flight by technicians of the 4751st Air Defense Group, (Alameda). Hawthorn Field, Santa Rosa Island (L. Rostov) is the Fifth AF's complex, Hawthorn looks up Boscow A and B development. Being built over the Gulf range and has added mission of training new IM-98 crews and online maintenance personnel of current ones.

which went the long etc. Since July 1998, five Bosnian squabblers have been turned into Vans, where there's likelihood finding crows feeding a Bosnian with red, leaving white and making by its liquid insect booster. Convert protective clothing is resistant to mild penetration for only three minutes, according to Lyle Robinson, but they state that new clothing soon will be in use providing protection for several hours.



MISSILE ENGINEERING



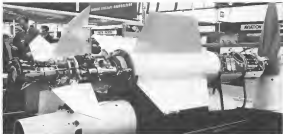
Four English Electric Thunderbolt anti-aircraft missiles with tracking and support equipment are displayed at Farnborough.

British Demonstrate Thunderbird Battery

After assembling Thunderbird launching battery members of Royal Artillery learn replacement aspects in handbook.



English Electric, state exhibit at the 21st Triang Display of the Society of British Aircraft Constructors at Farnborough, England, includes a Thunderbird with panels removed to show turbine design. Radar and other instruments are visible.



Thunderbird's independent engine and guidance vane are shown above. At left below, members of the 36th Anti-Aircraft (G.W.) Regiment of the Royal Artillery guide a Thunderbird onto a fully. At right, a truck is loaded into position as a Thunderbird can be loaded through an Armstrong Whitworth Argon crane transport's wing-type door.





MARTIN PERSHING two-stage, solid-fuel missile is moved on a transporter-erector-launcher (TEL) constructed by the Tropic Group. Thompson Ramo Wooldridge, Inc., and is carried by an XM474 tracked vehicle made by Ford Machine Corp.

Pershing Mobility Demonstrated to Army

ARMY PERSHING two-stage ballistic missile is fired from its mobile launcher during tests at Atlantic Missile Range, Cape Canaveral, Fla.



TRANSPORTER-ERECTOR-LAUNCHER, readily transportable by its low flier wheels and pneumatic tires that enable it to be towed short distances and maneuvered into position, permitting movement, erection and launching of Pershing in a matter of minutes.

Washington—U.S. Army command units in Europe got their first view of the previously secret Pershing missile system last month in a demonstration of the weapon's mobility.

Mobility shown was told for Seventh Army Field Commanders at Voths Army Base, Bad Koenigshausen, Germany, in an exercise of ground support operations from alert through prelaunch checkout. Pershing now being tested at Atlantic Missile Range will replace the larger liquid-fueled Red Stone throughout the Army.

In the demonstration, Ford Machine Corp. XM474 tracked vehicle brought the existing, mobile unit in launcher from a wooded area to launch site at 40 mph, negotiating a three-foot undulation in the terrain. Soldiers of 48th Artillery Group executed the unit after only a few days training, in riding prelaunching mobile in a scale practice.

Army mobile unit nuclear and non-nuclear XM474 vehicle and Tropic Group transporter-erector-launcher (TEL).

First launching using 17th TEL and TEL was made on Feb. 14 (AW Aug. 6, p. 56). Development schedule calls for full mobility demonstration by the end of the year. Both steps have been fired in rapid sequential tests.

TEL includes a dual-track crawler on a transporter chassis, which has four wheels so that it can be recovered at the firing site. Launch platform, supported by leveling jacks, is mounted on the rear of the transporter on a pivot and has an arm with a ring. Hoists raise the missile to its firing position, with a mobile mast supporting power-hydraulic and launch control cables.

Complete tactical package consists of the 34 ft Pershing, which has diameter

XM474 is a lightweight, track-borne vehicle with constantly high ground mobility.



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Next electroplating was tried—but the coat bond was poor, the surface rough.

Then they turned to plasma-jet spray techniques. Hoped here—at last—was the solution.

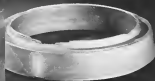
Solid-fuel firing tests proved it was—for the dense, sound "Plasma-Tung" coating passed its tests with no erosion, pitting, or nozzle pressure drop.

And metallurgical research is but one of the areas of inquiry we're putting our minds to at Allison.

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Illustrated is a refractory metal nozzle liner segment formed by a combination of plasma-arc spraying and forging.



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If you're considering the purchase of an ADF system, it will pay you to talk to your local Bendix dealer about the DFA-50. For further information, or for the name of your closest dealer, contact Bendix Radio Division, Avionics Group, Baltimore 4, Maryland.

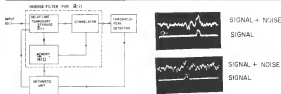
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AVIONICS



SELF-ADAPTING filter (left), developed by General Electric, tries to eliminate fixed waveform signals occurring in random manner that are buried so noise without prior knowledge of their waveform or presence. Block diagram shows major circuit elements. Two samples of waveforms used in GP tests are at right. These have signal-to-noise ratio of 10, but filter has operated with lower ratios.

Filter Detects Signals Buried in Noise

By Philip J. Klass

Scarcely a N.Y.-based aircraft company type of aircraft that automatically learns to identify fixed waveform signals occurring in a random manner and buried in noise, without prior knowledge of their waveform or presence, was found important applications in electromagnetic reconnaissance radar and communications.

The new technique, called *Adaptive Waveform Recognition*, was developed here by scientists in General Electric's Research Laboratories. It has shown itself the ability to detect signals that are buried in noise that they can not be detected by known waveform analysis in advance the nature of the signal, the oxygen reports.

Significant Advance

Adaptive waveform recognition marks another significant advance in the field of adapting or self-learning control systems. Representatives of this pioneering new type system are the General Electric Laboratory, Avionics (AWR July 7, 1958, p. 68; Feb. 4, p. 77), and the self-adapting autopilot (AWR Sept. 22, 1955, p. 68).

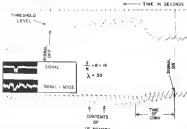
The disclosure of the new self-adapting filter technique was made earlier this month in England at the Fourth London Symposium on Information Theory in a report jointly authored by C. V. Jakowicz, R. L. Selzer and G. M. White, all of General Electric. It was presented by General Electric scientists at the symposium, the first of its kind, in the field of information theory.

In this, the filter receives in input receiving signals of Gaussian noise of zero

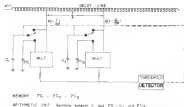
mean, which it does not pass. Then a signal is introduced in combination with the noise. For each signal presented the signal consists of negative M-shaped pulses occurring at random intervals of time, spaced 10 times per second at random spaced intervals of time. Within several seconds after the first signal pulse appears, the filter begins to filter its response. Within a few more seconds the filter is fully adapted to the incoming signals and passes them. If and when the signal disappears the filter automatically returns to its original no-pass condition.

The capability described to this point is not too important because it could be simulated by a conventional filter matched to the particular signals involved, assuming signal characteristics were known. But now suppose that the waveform of the signal pulses is suddenly altered to a different configuration of different duration, repetition frequency and signal-to-noise ratio. Without any change in the self-adapting filter circuitry, it will automatically sense the new signals and adjust itself to pass the new waveform.

It is this flexibility in self-adapting



OPERATION of self-adapting filter is shown in test recording. Using negative M-shaped pulse repeated randomly 10 times per second with signal-to-noise ratio of 10, filter required convergence time of eight seconds to detect presence of signal, modify its waveform to conform to signal waveform and to raise threshold level. Time moves right-to-left.



SCHEMATIC shows how input waveform automatically stored in delay line is compared in real time with stored reference of signal waveform, stored in capacitors C_1 , C_2 . Voltage product of each is obtained by multiplier and outputs of all multipliers are then totaled and compared with reference value by threshold detector to determine if there is sufficient similarity between actual waveform and one stored in memory. If no sufficient one is available, tuning capacitors C_1 , C_2 ... to better pattern of input signal based data. Info into memory contains enhancing memory of replica of signal waveform there.

Adaptive Filter Analogy

Principle of operation of General Electric's newly developed adaptive filter and the way in which its operation differs from a conventional matched filter, can be described by the following analogy.

Suppose that an intruder is to play his wits against one to gain entry. Further, though the stage door is controlled by a guard of extremely low intellect corresponding to a filter in an electronic system.

If each member of the audience is given a special key for the required role of the guard, it gives a copy of the pass and told to select only people bearing such passes that the intruder is analogous to a matched filter in which the guard/filter has advanced knowledge of the identification of passholders to be passed.

Suppose however that it is found that the guard's criteria have made considerable errors and the guard is told that he must therefore attempt to meet up each individual entering role to determine whether or not he is a member.

The guard starts out with the initial assumption that the intruder will be carrying an intruder's pass. This is not a new criteria since the intruder and pass play well and thus, the guard's criteria are being corrected.

But like the adaptive filter, the guard has a simple memory and he can make use of feedback.

He knows that each time he admits a person that is not a member, he should have not even admit him as he steps outside him.

The first time he not entry is carrying a black one and a pass, so the guard decides to not admit him. But he waits to see if the second of a third person coming up and finally decides he has failed to a pass holder. Meanwhile, later another man appears with an intruder's one pass and the guard admits him. Shortly after, the guard has a correct tuning up and decides that three two color-one intruder's one and a pass-one the significant marks of a member.

But not those persons who carry a pass and no intruder's one, so the guard admits him. But he waits to see if the second of a third person coming up and finally decides he has failed to a pass holder. He therefore decides he will admit those who carry an intruder's one and a pass, to ensure the guard's recall of previous criteria and pass entry. But again the guard was to see if the second of a third person coming up and finally decides he has no intruder's one. Again the guard's criteria has advanced criteria. This time the guard is told not to admit one carrying intruder's one and a pass.

Through this process of knowing and adapting with the aid of feedback and memory, the guard now develops an admission criteria which enables him to discriminate between members and gate members with a moderate high degree of accuracy. It is a somewhat similar process the adaptive filter learns to discriminate between noise which it should block and signals which it should pass.

characteristic, which makes the General Electric technique unusual.

If it were desired to pass signals of two or more different frequencies simultaneously, this could be done by using two or more adapting filters with different center frequencies.

Time to Adapt

The length of time required for the filter to recognize the presence of a signal and to adapt its response to match the signal called "convergence time," depends upon several factors including signal-to-noise ratio and signal repetition rate.

For the circuit configuration used in initial experiments, which does not represent the optimum in visualization or performance computer calculations obtained the following convergence times under the conditions indicated:

- Four seconds for a signal-to-noise (S/N) ratio of 20 at a pulse repetition rate of 45 per second or five in S/N of 10 at a repetition rate of 15 per second.
- Six seconds to adapt when an input signal twice the size of energy divided by noise per unit bandwidth.
- Eleven seconds for S/N of 5 at a repetition rate of 45 per second or five in S/N of 10 at a repetition rate of 15 per second.

Principle of Operation

The self-adapting filter has a memory circuit in which it stores its current estimate of the signal-to-noise characteristics of the incoming signal. This estimate of signal characteristics stored in memory gradually decays with time unless it is periodically reinforced. The experimental filter memory has a decay time of about 15 sec., but value would depend upon intended use.

The filter continuously compares its memory's estimate of the incoming signal characteristics with the input to the filter. When it finds a reasonably close match (estimated) the estimate of signal characteristics stored in memory is reinforced.

When the input to the filter is a valid Gaussian noise (the signal), the estimate of signal stored in memory is constantly reinforced like the noise. This means that there is no continuous periodic reinforcement and therefore, an effective reinforcement of signal estimate is necessary.

But as soon as a signal appears, it is rejected in the form of a series of pulses of reinforced waveform, which features of the waveform feed back to the memory. Now, as the filter compares its memory's impression of the signal with incoming pulse at each waveform, or correlation. This results in further reinforcement of the estimated signal in memory. After the required convergence time of a few seconds, a completely precise replica of the incoming pulse waveform has built up in memory and the

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Footnotes to the Crusader's 203,512th flight
This was a test flight for a new Crusader—the all-weather F8U-2N pictured here. It was a busy day for Crusaders all over the world. Over 700 of these carrier-based fighters have joined Navy and Marine squadrons since the first Crusader won the Thompson and Collier trophies. With the more powerful engine and armament, the advanced catapult and roller of the new -2N, this fighter series is being improved for the third time in minimum cost and without interrupting fleet readiness. This is "design growth." This is why, fighter for fighter, the Crusader has logged more peace-keeping flight hours than any other 1,000-plus-raph aircraft in U. S. service.

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Silicon Radiation Detector

Silicon radiation detectors like this one (MPE Feb. 15, p. 81) will check amount of radiation man may encounter in space during simulated space crew tests experiments about outgassing high-altitude helium and other inside flight laboratory made by Hughes Aircraft Co. recently were delivered to Air Force School of Aviation Medicine, Aerospace Medical Center, San Antonio, Tex. Pulse, emitted by the detector when struck by charged nuclear particles are amplified, fed to telemetry system within space vehicle and transmitted back to earth.

several taps into which input feeds.

In going to a greater number of dimensions, it should be possible to make filter response to more complex wave forms and also perhaps to reduce cost. Significant time. Scientists plan to experiment with systems of 100 to 500 dimensions using digital computer simulators to avoid complexity of constructing smooth with so many dimensions.

Outperform Humans

However, even with the 10-dimension system the new technique is able to outperform human observers. In these experiments, using an input with an S/N ratio of 10, the filter could detect presence of signal consistently. But human observers who knew the shape of the signal were unable to detect its presence about half the time, using both visual and aural stimuli, CE reports.

Although an optimum system probably would consist of several adaptive filters, the principle of operation can be explained on the basis of a single filter. Here elements of the 10-dimension experimental current (see block diagram) include the following:

- Temporary storage, into which input feeds, consists of a tapped delay line. For the 10-dimension circuit used in General Electric experiments the delay line has 10 taps, each spaced one millisecond apart. Delay line is hard limited to 500 cps.
- Memory, which consists of 10 exponen-



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one for each of the 10 elements of waveform to be stored. Each replica is identified by a number whose value determines the delay time of signal replica stored in the capacitor network.

• **Calculator**, which consists of 10 multi-phase-line for each delay line type and recovery capacitor. Each calculator takes the vector product of the value of input at its respective delay line tap and the signal replica stored in its respective memory capacitor. The outputs of the 10 calculators are then added.

• **Threshold peak detector**, which compares the sum of the 10 vector products with a stored reference value to determine whether there is sufficient similarity between the input and the signal replica in memory. If the sum of the 10 vector products equals or exceeds the stored reference value, indicating similarity, the threshold peak detector activates the reference unit.

• **Reference unit**, when activated, causes the signal replica stored in the memory capacitor to be recharged or enhanced. This is accomplished by means of 10 additional capacitors, one for each tap on the delay line. Each of these capacitors is permanently connected to its respective delay line tap so that the corresponding element of input waveform is stored in the capacitor. When the reference unit is activated by the threshold detector, indicating the presence of a signal, the value stored in each of these capacitors is transferred to its respective memory capacitor, thereby enhancing the signal replica previously stored there.

Value increases

When the sum of the vector products equals or exceeds the reference value in the threshold detector, and activates the reference unit, the value stored in the threshold detector automatically is increased in effect. This means that as the memory begins to encounter similarity with the incoming signals, and feedback enhancement results in building up a more accurate replica of the waveform of the signal in memory, the filter automatically increases its selectivity, demanding greater correlation between input and memory. If the input has indeed "disappeared" the presence of a signal and has not been momentarily "boiled" by noise, there will be increasing correlation between input and memory necessary to activate the reference unit despite its higher threshold value until an accurate replica of signal is built up as necessary.

It is not necessary that the memory segments contain an accurate replica of the incoming waveform for the filter to start to adapt to a signal, i.e., replicate the waveform. All that is required is that memory contain a component of the incoming signal.

The reference value in the threshold

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Torque Generator for Sensitivity Range:
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Noise Density: 0.4°/hr/g
Accuracy: 0.002°/hr/g
Dimensions: 1.0 in. x 2.0 in.

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INSTRUMENT CORPORATION

placed adjusting tape recorder leads to reflect level of this pick-up. Designed by Hitec, Inc. (13 Saginaw, Calif.), the microprocessor contains two drum stations, five readers and three expansion in a volume of 0.075 cu. in. Amplifier has frequency response from 200 cps to 200 kHz, provides 74 db gain with harmonic distortion of 0.1% and noise figure of 3 db, according to the manufacturer.

► **NAVIG System for Space Propulsion**—Global satellite tracking network, consisting of seven high-power radars and computers located along a great circle, capable of detecting and tracking earth satellites to keep a continuous listing of all space objects was proposed by Peter R. Das, Washington, D.C., at recent International Astronautical Congress in Stockholm. Das said that such a "Space NAVIG System" will be needed within a decade, when there may be 1,000 earth satellites in orbit.

► **RTCA to Hold Autumn Meeting**—The silver anniversary meeting of the Radio Technical Commission for Aeronautics, to be held in Washington, D.C., Nov. 1-2, will feature four technical symposia. Subjects include: instrument landing, collision avoidance, data transfer and reliability. Three members will be chosen from U.S. and foreign governmental agencies and industries. Unusual feature will be an additional group to be called "Devils Advocates" whose assignment is to see that dissenting points of view receive adequate discussion. RTCA meeting will be held at the Sheraton-Park Hotel.

► **Non-Volatile Transistor**—New, chemically insensitive, so small they are not visible to the naked eye, will soon be commercialized by Pacific Semiconductor, already maker of the smallest commercial transistor with its gate line (AW Aug. 11, p. 34). First version of the new transistor, as yet unnamed, will be electrical equivalent of the IN105 and must be viewed under a microscope.

► **Ryan Continues to Diversify**—From Aircraft Co., San Diego, Calif., to crash decked formation of a particle and subsidiary Ryan Transdata, Inc. to specializing in design and development of data handling equipment. William C. Alexander, formerly general manager of the Strawberry Canyon Division of General Dynamics, will be president of the newly formed company.

► **Houston Mirrors See Realities**—Contract of Pacific Munk, Boring, an instrumentation plant at Keesler Park, Hattiesburg, Miss., to be completed with NASA's Project Mirror is nearing completion. Station will have RC-117S-16 radar, IRW-2 computer transmitter

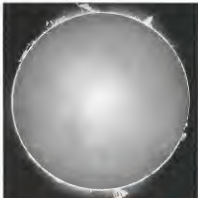


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and other control-communications equipment, installation of which is expected to test for full checkout before first Mercury shot.

► **Signed On The Dotted Line**—Major contract awards recently announced by various manufacturers include the following:

► **Microtype Associates, Inc.**, Basking Ridge, N.J., 901,680 Navy contract to supply photo-shifting techniques that show promise for electronic scanning order interfaces and to supply models of suspended-type phase-shifter devices as result of the order.

► **Sperry Gyroscope Co.**, Great Neck, N.Y., 57.2 million contract from Bureau Air Development Center for development, fabrication and installation of AN CSP-44 nuclear detection electron unit.

► **Computer Systems, Inc.**, Monmouth Junction, N.J., 520,497 contract from Navy for missile image plotting board. Plotting boards to measure 48" x 192" in. will be installed at Pacific Missile Range command station to coordinate all firing.

► **Thomson Products, Inc.**, Los Angeles, contract from North American Aviation for design and development of communications, navigation and identification unit systems for the North American B-70. Devices will be required to operate at higher temperatures for longer periods than any previous aircraft system, excepting the Conquest also is being developed from Navy Bureau of Weapons for research and development on high altitude, high temperature high-powered antennas for L-band UHF communications and nuclear weapon sources.

► **Federal Electric Corp.**, \$106,400 contract from Bureau Air Medical Area for operation and maintenance of Project Develop atmospheric nuclear core measurements terminal at Thule Air Base, Greenland. Company also is awarded the tropo system provides communications link between Thule Radio Music Park Warning Station (RMLWS) and DEW Line national communications system at Cape Davis Radio Island. Company also is awarded the company at Thule will be Danish reference.

► **Selenus Electric Products**, subsidiary of General Telephone & Electronics Corp., 55 million Bureau Air Medical Area contract for intrinsic communication system at Adak missile bases in Wisconsin and Kansas. Selenus provides communications between Adak squadrons command posts and the missile launch sites. Company's Wisconsin Laboratories also report a \$5.2 million contract for data processing equipment to direct movement of Navy's 600 lb diameter radio telescope being constructed at Sugar Creek, W. Va.

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LABORATORY MODEL of an electrical magnetic induction plasma engine at Space Technology Laboratories given birth as it converts electrical energy into the power which might propel deep space probes

STL Operating Lab Plasma Engine Model

Pasadena, Calif.-Laboratory, version of a magnetic induction plasma engine which will enable man to be the simplest and most reliable electric nuclear reactor is now operating at Space Technology Laboratories, a technical center of the Advanced Group for Naval Material Research and Development by NATO was told last month.

Dr. Milton U. Glance, vice president of STL, told the meeting which had concluded its second scheduled per-

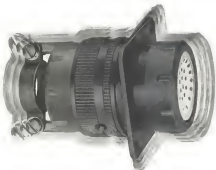
formance techniques that all concepts associated with magnetic induction plasma engines are sufficiently well understood to permit development of engines suitable for deep space probes.

Hydrogen deuterium and lithium or, possibly both for the space plasma engine, Glance said. The first two would provide power driving that of the ion engine. The deuterium fueled engine would be well suited for deep space missions while lithium would produce enough power to make it attractive for the in-between region of satellites and spacecraft where chemical and ion engines cannot operate as efficiently.



Goodyear Completes Taxi Radar Unit

Traffic radar models first production aircraft, for a new airport taxi radar system developed by Indianapolis Instrument Laboratory and made at Goodyear Aircraft Corp. in Akron. Ohio. System can detect aircraft and buildings up to a 4 mi. range. Radar is made of Bendix-McWright material with standard electronic face and aluminum housing. One can rotate 360 deg. at 60 rpm. It will be installed at major U. S. airports.



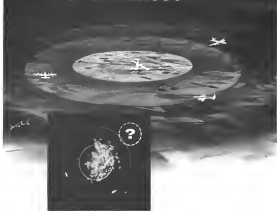
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How can a radar operator know when system performance gets marginal? How can he assess the reliability of what he sees—not just in the present performance area, but "out there" on the fringe of his radar's range?

The FAA signed a contract with Sperry to solve those problems, and the result is the new Sperry Radar Performance Analyzer. This instrument will find and analyze variations in transmitter power, receiver noise, tuning,

sensitivity and subcarrier stability. It will spot performance deterioration and maladjustments on a continuous non-interfering basis, indicating the moment to maintain status of the radar.

One form of the Analyzer is being delivered for use with FAA surveillance radar at a number of airports. Other versions have been developed for missile guidance, tracking and search radars. Evaluation techniques employed are compatible with all modern radar installations,

such as pulse Doppler, MTI, pulse compression, frequency compression. Whatever your system, the Sperry Radar Performance Analyzer will assure continued performance to spec, or rapid fault location eliminating system "down time."

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• **Miniature shaped time selection**, measuring only 665 in. in diameter 17 in. long, weighing 1.6 lb., provides digital read out on 6 1/2 in. mechanism for 1,000 hr. total of 1 hr. increments for 10,000 hr. total. Readout mechanism



is .008 in. high, approximately the size of cigarette electronic indicator is available for operation from 75 vdc or 115 vdc—400 cps. Manufacturer: Elgin National Watch Co., 135 Bluff Cox Bld., Elgin, Ill.

• **High-speed punched tape reader**, on giving optical scanning system, is capable of stopping on character at several tape reading rate of 200 light/sec. character per second. Device has depth of 550 ft. overall width. White paper tape. Normal tape reading speed is 20 in./sec. with fast reading rate in both directions at up to 1,400 characters per second. Device weighs 9 x 11 x 17 in., weighs 90 lb. operates from 120 vac, 60 cps. Manufacturer:



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Arc Wind Tunnel Simulates Re-Entry

Pete Abo. Caltech's prototype rotating-arc wind tunnel to provide a constant flow uniformity-free stream of gas for simulating re-entry conditions of 20,000 fpm and 13,000 ft/sec extended periods has been developed by Valva Inc., inventor of Hot Cap.

The unit has been successfully developed to deliver gas streams with specific enthalpies in excess of 10,000 Btu/lb at pressures as high as 400 psi and at flow rates of the order of 950 to 0.1 gpm.

The Valva tunnel creates steady-state conditions by extended test durations which have run as high as four minutes. Power input for the prototype tunnel ranges from 1.4 to 1.5 megawatts although models can be designed for a variety of power inputs depending on customer needs according to Valva.

In addition to variable conditions of static enthalpy, the unit provides a wide controllable range of Mach and Reynolds numbers.

For simulating the heated gas in a shockwave which occurs at a pair of concentrically positioned, water-cooled copper rings located between the pillars of a circular electromagnet. The arc, initiated by the explosion of a 3 mil tungsten wire between the cathode and anode, forms in an annular gap between the outer cathode and inner anode.



INSPECTION: For water tests prior to operation of Valva arc-heated wind tunnel is made by engineer Glenn Tuckler. Tunnel provides wide range of Mach and Reynolds numbers.

Rotating-Arc Plasma Generator

Chamber pressure (psi)	10	100	500
Air flow (lb/min) - Steady A	0.30	0.12	0.09
Steady B	0.40	0.160	0.120
Air velocity by flow - Steady A	1,000	1,000	1,000
Steady B	14,000	8,000	7,000
Power to air flow (kw) - Steady A	100	100	100
Steady B	100	375	300
Diffusion gas flow (lb/min) - Steady B	10	30	50
Steady B	40	22	30
Arc voltage (volts)	100-200	500-550	600-650
Power to arc (kw) - Steady B	500-600	1,200-1,400	1,700-2,000

The arc is driven by a magnetic field at right angles to it at high rotational velocities around the annulus. The ionizing arc, or after gas, is heated by passing through the annulus on its way to a plasma chamber prior to entering the heated nozzle. Steaming some 6,000 Gauss the magnetic field is produced by water-cooled dc current coils located within the air electromagnet. Valva reports that contamination of the stream due to erosion of the cathode is avoided by the spacing of the arc-anode which eliminates transient re-coming of the arc every two long on

any single point of the material. Gas losses during times of 20 to 30 min caused no discernible loss of electrons.

The tunnel consists of a high pressure steel shell, approximately 2 ft in diameter by 5 ft long which contains a plasma chamber, the electron-supply and nozzle. Upon leaving the nozzle the hot high speed jet (shock) into a low-pressure test chamber which is unstreamlined.

The entire high pressure chamber is under the stagnation pressure generated for the test. Water stream and water through two separate injectors immediately is circulated to coolants in high-pressure hoses. The unit is designed for an input water flow of 200 gpm to the annulus at 100 psi.

Designed under various loads, the arc-driven was developed to a research tool to provide a clean, hyperthermal environment for conducting hypersonic aerothermochemical and materials investigations on a continuous steady-state basis. In addition to providing a testing facility for aerodynamic and space vehicle designs, the tunnel can serve as a tool for experimental research on plasma physics. Using gases other than air, the tunnel also can simulate various rocket and propulsion phenomena.

Valva is currently designing and fabricating a smaller equipment for a major industrial firm and is preparing contract research awards on methods for improving the performance of certain components of the unit.

The company is also building instrumentation for measuring various properties of the high-temperature gas stream and, under contract with NASA, is developing a shock-tube-a device for measuring local surface flow over a blunt body in a gas solution.



CAPSULE designed for three men is shown in artist's conception at left. Space station and winged re-entry vehicles are of top and below. At right is ducts will test questions.

Aeronutronic Studies Three-Man Space Vehicle for Long Orbits

Newport Beach, Calif.-Proving structural configurations for "men advanced" Air Force vehicles are being studied at Ford Motor Co.'s Aeronaerics Division here under a \$161,680 18-month contract study contract awarded by USAF's Wright Air Development Division (AFD Sept. 10, p. 59).

The study is concerned with the structure of a three-man vehicle that would allow the length of various altitudes for extended periods of time. A cylindrical shell of double end construction has been designed by Aeronaerics' Space Technology Operations Group as a primary structure.

Pressure Vessel

Advantages of this type of structure are that it could withstand the mechanical loads imposed by launching at sub-orbit and also serve as a pressure vessel to shield against cosmic and solar radiation and protect a crew from solar ultraviolet impacts. The space between the walls would provide protection through which various gases could be pumped to maintain crew cabin temperatures within limits.

The structure under study is 15 ft long with an inside diameter of 7 ft. Personnel are incorporated for "space relief," a highly secure area providing

complete shielding from cosmic radiation. Interiors also is compartmented for crew safety if the shell was penetrated by a meteorite.

A major problem at this time is the establishment of shielding requirements, according to Dr. Seymour Lippert, head of the aeronaerics as well as because of a lack of information on cosmic radiation intensity and the extent of human tolerance to radiation dosage. Aeronaerics subcontractors state that a structure sufficient to protect against meteorite penetration will provide adequate shielding against effects of the observed energy levels. However, there is concern over shielding against radiation generated by solar flares which emit as particles of billions of electron volts of energy.

Capsule Shielding

Shielding against a portion of one billion electron volts (BEV) requires 22 in. of lead. "In developing the original particle of energy, other kinds of particles and solutions are needed which continue to penetrate the shield," Dr. Lippert said. "So something in excess of 22 in. of lead would be required to shield a human occupant against BEV particles."

The probability that a single solar

flare will occur at any particular time is not well known, although they have been observed on the order of about two a year. If information becomes available so that solar flares can be predicted, launches can be timed to avoid them as warnings from the ground could permit a crew in action to turn on shields or the radiation in the "storm cellar" which would provide some measure of protection.

Report Criticizes Atomic Planning

Washington-Present management problems in the US atomic energy program in the lack of sufficient long-range planning to move planning concepts and ideas from the basic research stage into full-scale development programs. The recommendations on research and development of the Joint Government Commission on Atomic Energy said.

In a report titled "Treaties in Atomic Energy Research," the subcommittee and the principal long-range planning problem is the "selection of projects and need in atmospheric impact, control," "in which the existing projects of defense applications are completely irrelevant with the personnel, schedules and expenditures at short-range urgent work."

In contrast the subcommittee called for a greater volume or more lead public information of the atomic energy

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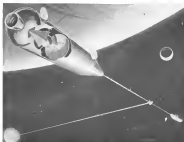
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Lockheed Scientists Envision Mars Vehicle

Massed flights to Mars and Venus during the 1970s are envisioned by scientists at Lockheed Martin and Space Division at Palo Alto, Calif., utilizing a vehicle such as a depicted lander. Chemical rocket boosters needed to reach interplanetary flight speeds would be used in part of the space vehicle and parked for the light-anchoring life support systems would be carried with the booster fast tank, supported on the rocket motor structure. Two booster rockets, which would be jettisoned by other attached boosters, would be fired one each orbit, carrying crew and payload. Once on course for Mars in parallel flight paths, the two vehicles would be strong together by a ball-and-socket cable. Maneuvers would be performed by using small vector thrusters.

progress, however it also the solution to the long range planning problems as a continuing review of the best technical options of the above systems by the Congress, the executive branch and the public.

"This review is intended to develop perspective, and progress in these three bodies regarding the potential of atomic energy."

Some of the potential atomic energy projects listed by the subcommittee report which have been declared feasible for immediate use, nuclear reactors are production of chemicals, recovery of minerals, construction of large underground bunkers with very high available energy, excavation, construction of dams and irrigation canals.

"The only advance projects with space potential discussed were those already being pursued, such as Rover, Snoop and controlled fusion. Controlled fusion is still considered many years away from hardware development but it has the potential of producing the first high thrust, very high specific impulse, rocket engine and eventually would combine the best features of the Rover/Rover-class rocket and an ion engine."

Rocketing just behind a greater awareness of better technical opportunities he closed, the subcommittee believes, is a need for Congress, the executive branch and the public to review quickly the tri-

dimensional method of financing government agreements on a crash basis.

In its review of atomic energy research, the subcommittee found that out of the greatest problems "was the need for long-term assurance of funds."



Shock Waves Reach Mach 80 Speeds at Impact

Collisions of two shock waves traveling at Mach 50 speeds lighter in this isentropic shock tube at Boeing Airplane Co. Initially, the waves travel at Mach 160 and are slowed to Mach 40 at impact. Tube is made of transparent glass and two liquid nitrogen poured into a vacuum tube to help obtain a very low viscosity in the tube.

ing of processing projects, rather than just better budgeting.

General funding level of the atomic energy program was considered adequate by the subcommittee with the Rover project being the major exception. The Rover project is a "late stage of development" and requires large outlays of money (unavailable) to take advantage of the technical progress which has been made with the nuclear rocket concept.

Apollo Bid Conference Attended by 88 Firms

Washington-Wide creation of industrial and research apparatus was expected at recent bidding for prospective bidders for study, contracts in the multi-stage Project Apollo system (AW Sept. 19, p. 10).

Most major aerospace manufacturers were among 88 firms attending the Conference. National Aeronautics and Space Administration will receive bids until Oct. 10 and a selection board will name two of three firms to receive task contracts about Nov. 14.

Firms represented at the conference were:

Ames-Corner General Corp., Aerodyne Development Co., Aerojet Manufacturing Corp., Aerovironment Division of Ford Motor Co., Alcoa Research Division of Garrett Corp., Allied Research Associates, Inc., Allied Properties, Inc., American Bosch Arms Corp., American Machine and Foundry Co., Amstar Research Foundation, Arco Corp., Bellver-Russ Hamilton, Bellville Memorial Institute, Berthel Corp., Boeing Aircraft Corp., BSA Associates Corp., Bellco, Indus-

trial Corp.'s Aerospace Labs. Inc., Boeing Systems Division, Boeing Aerospace Co.'s Aero-Space Division, Bristol and Bell, Inc., Burnham Corp., C-108 Laboratories Division of Columbia Broadcasting System, Inc.

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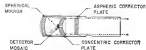
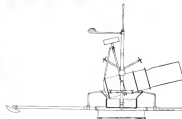
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Satellite-Detecting Telescope Being Developed

Billion-horse satellite-detecting telescope being developed by Electro-Optical Systems for USARF (AW Sept. 19, p. 17) has prototype for action by next



the elements of Command Control:



Data Acquisition and Application

The measure of any command control system is time. Success depends on how fast. The system can close the loop between detected action and counteraction. Command control begins with data acquisition and ends with data application. Here, IBM's experience encompasses subsystems for the acquisition of information from distant and varied sensing devices, and for the presentation of refined data to commanders for military action.

Data Communication

High-speed networks that link command control computers require facilities to assemble and direct masses of data. Time is important. IBM data communication capabilities are evident in systems such as SAMs, a real-time activity control network, and avionics, a rugged, mobile field control center. These systems employ communication techniques involving real-time data channels, data conversion and message switching.

Data Processing and Control

Information must be quickly reduced and refined through computer processing to prepare it for command decisions. Here again time is paramount. IBM has solved special data processing problems with standard systems such as the 709, installed for space vehicle orbit computations, and advanced systems such as the AN/PSQ 35X, in production for the Strategic Air Command Control System.

...all systems capabilities of IBM

IBM solutions to command control requirements range in scope from antishubmarine warfare studies to Air Force control systems like project 473L, and from the compact avionics to avionics, the world's largest computer. From study to implementation, IBM has proved its ability to solve the problem of time in all three elements of command control systems.

Patent Systems Division, 525 East Montgomery Avenue, Redwood, Maryland

IBM

Division, Vero Corp. of America's Lab centers Division, Washington Technology Associates, Inc., Western Electric Co., Inc., and Western Research, Inc.

Space Consultants Appointed By NASA

Washington—Twenty-five consultants have been named to advise the National Aeronautics and Space Administration on key areas of space science.

NASA and appointment of the consulting group at leading scientists had been planned for some time as part of the organizational structure of the Space

Science Steering Committee. This committee has responsibility for selecting scientific satellite and probe experiments.

New consultants and the areas in which they will serve are:

- **Astronomy**—Dr. Dirk Brown, Yale University Observatory; Dr. A. K. Roth, Princeton University; and Prof. William F. Fowler, department of physics, California Institute of Technology.

- **Ionospheric Physics**—Prof. Robert A. Heibel, department of electrical engineering, Stanford University; Dr. Hans Haerig, Air Force Research Division; Dr. Francis S. Johnson, Lockheed



Titan-J ICBM Launched at Cape Canaveral

First successful launch of a Titan II missile. The Titan II missile was launched successfully in 15 minutes. Shot was made 1,000 mi. down the Atlantic Missile Range.



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One of many different Honeywell Modular Gyro Reference Systems is shown in right. This all attitude system is especially suited to high performance tactical and provides pitch, roll and heading information for the numerous flight control systems, radar, gun sight attitude reference, magnetic compass reference, bombing computer and display navigation. Over 24 different gyro reference systems are available to meet all aircraft, missile, space vehicle and special purpose land vehicle requirements.

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Typical systems available provide Standard Attitude, True Heading Attitude, All Attitude and True Heading Attitude, Multiple Output All Attitude, and Low Drift Attitude All Attitude. Many others are also offered. These systems are applicable to a wide variety of vehicles ranging from commercial and military transport aircraft, to heavy tactical aircraft, high performance aircraft, missiles, space probes, and special purpose land vehicles.

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To obtain a copy of Honeywell's new book, "Gyro Reference Systems," contact your Honeywell representative, or write: Honeywell, Automated Division, Dept. AF-9-002, 2600 Ridgway Road, Minneapolis 40, Minnesota.

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Titan Engines Reach Final Assembly at Aerojet Plant

Second stage engines for USAF Minuteman intercontinental ballistic missiles are shown on the assembly line at the Aerojet-General Corp. of Azusa, Calif. Engines are being tested for a static test (above left). Two engines at top right are in the final assembly area for checkout prior to packing for shipment. Second stage is loaded onto its container (below). Engines deliver 16,000 lb. thrust.



AERONAUTICS, September 28, 1960

These weather items prepared in consultation with the United States Weather Bureau

FLIGHT PLANNING

CEILINGS AND VISIBILITY



The Civil Air Regulation's "Visual Flight Rules" state that all VFR flights must remain clear of clouds—1000 ft above 1000 ft below, and 500 ft horizontally in uncontrolled airspace. At altitudes of 100 ft or more must be maintained in controlled areas above airports and control areas (including enroute). Ceilings of 1000 ft are required in control zones. In controlled control areas above airports must be 1000 ft above, 500 ft below, and 1 mile horizontally.

In planning VFR flights you must determine that conditions along your proposed route are at least 1 mile of all terrain—5 miles in controlled areas and 5 miles in uncontrolled control areas. This can be done in the following ways: consult your local Weather Bureau office and check latest weather reports; check latest forecasts and compare with pending ones to judge trend; look for special advisories, pilot reports (PIREPS), now formalized into your flight path—over, under, or around a cloud problem; lastly, during flight, a steady terrain—windings that appear high enough to permit flying underneath may allow you to clear mountains. Remember, haze, smoke and precipitation—especially snow—may reduce visibility below VFR limit. Keep tuned to area FAA—FLIGHT SERVICE



If weather at your destination appears unsuitable, look for alternate or alternate airports in a pilot's guide. Also, check the words "difficult" and "advisory" in that you will have sufficient fuel to reach your alternate.

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BUSINESS FLYING

Business Pilots Need Executive Ability

By Herbert J. Coleman

Mt. View, N.J.—Today's business and executive pilot is going to have to be not just a pilot but also a businessman and good list of the executive.

This was the consensus of top top executives, business pilots at Vanhook Corp.'s annual Operations Symposium here. The pilots, who have studied a level of corporate responsibility, that usually demands that they build up a well-run, efficient department that can show its value to the company.

As E. Tilden Peabody, chief of General Motors' executive fleet first class (airborne-powerful Command) put it:

"Today's pilot doesn't just fly. He must also be a businessman. If he is not conducting his operation with the maximum of efficiency and safety."

"Pilot now are growing up to be managers, developing sound business principles—and that means a knowledge of the business. It's not the control of his airplane; it's necessary, and above all, he must stand for no shoddy or inferior phase of his operation."

Complex Aircraft

The pilot is faced with more complex aircraft. Turbojets, jets and he must deal with advanced technology. The pilot must give the most detailed attention to his own knowledge and to his own flying program.

Referring to aircraft complexity, Peabody said the day is not far off when even of larger business airplanes, jet turboprops, turbojets will find it necessary to add a third man to the flight deck, primarily responsible for maintenance and ground handling.

"This will be necessary, chiefly because fuel base operations are still relatively primitive with respect to refueling and handling problems, according to Peabody."

However, Charles Mann of Seaboard, disagreed with this philosophy, contending that the ground handling job is the primary responsibility of the pilot and must and should be handled by them alone.

Executive Capability

"During the past years, capabilities developed in today's pilots," Mann said, "management has learned a lot about business flying, and it's hard to say there are more. Pilots he said must be able to explain equipment, practices and operational rules to management in dollars and cents terms particularly

in this age of highly complex engine and radio systems needed for a true pilot's operation."

No executive wants to schedule a meeting in Chicago and find himself in St. Louis as an alternate. "Mann explained. "Because of this, the business pilot must know what his company demands, what kind of equipment will fit that demand, and how to obtain it at the best possible price."

Sound planning, safety and control is the basis for any good business flying operation, according to Earl Hauer, chairman of the management of members of Ohio Oil Co. In addition, the pilot must be faced with complicated bookkeeping and such, in his operational practices, but in his maintenance records and logbook, he added.

Management expects the business pilot to run his operation exactly in the manner of any other corporate department—efficiently. The cost of the pilot in the farthest back of the company is done.

The program of running your own business, in the winter and in the northern late months, is the way men in a planned program of flight but not for the people involved in the company, Mann said.

But let the pilot speak in a quiet

business exchange of information among business pilots, to keep up a knowledge of trends in research and development. Another is a constant analysis of the pilot's portable flight equipment and its reliability problems.

In a discussion of fixed base operations, Robert B. Olsen of National Leasing Co. made three points in a strong plea for better relations between the operator and the flight crew.

- **Pilots should brief the operator on his plane's maintenance history and should make, for work, repair is complete, and correct in position.**
- **Assign a crew member to the job as an observer, if possible. This is of utmost value in the "nightmare" jobs that can crop up in an overhaul.**
- **Don't comment for a minute in critical and then decide, in the last seconds, to modify the landing gear, still expecting the same do-overs.**

- **Make a firm contract or work order, expect the work in progress, and don't make any change on the side.**

- **Use fixed base equipment, he suggested.**

- **Don't possess what you can't do.**
- **Require complete authority under a contract or work order.**

- **Give the pilot a day, planned, arriving in the morning and morning.**

- **Be fair.** "We all realize that the fixed



Silver Sixty B-26 Conversion Starts Tests

Flight tests of a deep heritage conversion of a Douglas B-26 (A-1) July 27, 1959, p. 55) have been started at Los Angeles, Calif., by Rhodes Berry Co., the designer. Company had been preparing the left modifications to allow passenger seating room and added amenities. Flight departed the Silver Sixty, can seat 14 passengers. Rhodes Berry firm is set in a million, however, in South American republics in 20 to 30 days. Significant changes are Part of W. H. Berry & Co.

SIXTH ANNUAL
Aviation Week

BUYERS' GUIDE ISSUE



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AVIATION WEEK's Annual Buyers' Guide is one source for buying information in all segments of the dynamic aerospace industry. It's on the engineer's desk...at his fingertips...readily accessible...with needed information.

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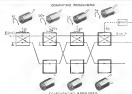
TYPICAL PROBLEM



PROBLEM: Suppose a computer is given data on aircraft with ambiguous bearing and range information along the arc of a great circle.

- Ca—bearing
- MO—bearing measured from present position to target
- PO—latitude of present position
- LT—latitude of target
- Q—Great Circle distance from present position to target

SOLUTION



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box operator in what is called a "dual" organization, but more likely a profit to cost."

Having the right operator's experience on the job is of prime importance, Olson said, "since he will catch errors the airplane but he can also waste the billing."

Job Dwindling

Spending less on the current flight, W. T. (Bill) Davis of Piedmont Airlines, said he "knows the fixed base operators have their problems, but we have to learn to run." He recommended finding the exact costs, getting a down-time deadline and "tell the job cost to see that you get the correct job done." He also stressed:

- Be sure the fixed base operator has back up his work and get Federal Aviation Agency approval on the job.
- Get the job in writing and furnish drawings to the base, if needed.
- Set your standards high and use that the fixed base operator has to go to them.
- Training in the field of "down time" maintenance is essential in getting it out. Arnold Hanes of Jacksonville Steel and his company has found considerable savings and quality control by running its own flight maintenance base. Both Hanes added that in the 14 years ago, he and the system allow plenty of progress of inspection and maintenance, no delays in maintenance projects and coordination of parts and controls. "How many times have you checked in some airplane after a repair job and found that the switches have been moved?"

Cost Analysis

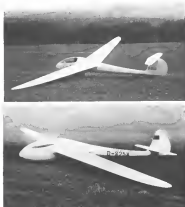
Cost analysis has shown that self-maintenance is more convenient and is "cheaper and better" according to Hanes.

The brought a sharp decline from Nimitz Maintenance of 40 percent in the winter, who said "regarding the cost picture, I think we can provide lower cost on both volume business and on customer services. As far as quality control is concerned, the fixed base operator is just as concerned about his fixed cost as is the maintenance operator."

Increasing importance of the turbine engine to business flying demands total pilot attention in the maintenance fix some, like General Motors (1) run a line of life, but for the smaller operation like Lake Aircraft Corp., owner of the Lake Amphibian, it is the three phase at the top of the Chevrolet line.

Said John L. Steiner, Lake Aircraft president:

"We have made preliminary design plans on installing a turbine on our Amphibian, and we think it will work fine. But it is a question of being fast and being a hero in starting its business. At



Germany's Phoenix Glider

Validated T-10 version of the German aircraft Phoenix FS 24 glider was flown by the 1978 open door world champion at Leningrad, Poland, Team Captain Hans G. Genssler, into sixth place at the second flight. World Gliding Championship at Ditzingen, West Germany (14W Feb. 15 p. 502). Size is 52.5 ft. length 22 ft. wing area 194 sq. ft. First prototype Phoenix (Genssler) designed points to Dept. Reg. Nippon and By Apollo of the Federal College Stuttgart, was introduced at the German Glider Competition held last summer at Krefeld-Breisacher, Paderborn is now in the hands of Nipponische Nippon-Gliding. Nippon/Tech, an associated company of Nippon-Entwicklungs G. K. Munich.

the moment, so, price is also in line now.

Since, of course, space for the Amphibian. Therefore, as of total response to large companies, particularly in the two-engine field, which are mainly competing in a race of gliding powerplant technology.

PRIVATE LINES

Super-V Two-engine conversion of the single-engine Mustang was unveiled by the American Mustang Co. (14W Aug. 12, p. 107) will make a small but useful solo flight during the month of June, on Oct. 15. The Super-V will be flown by Henssler will be to California, New York, Glider, Los Angeles, Santa Ana, California, Riverside, San Diego, and Los Angeles.

Walt Island and across to Honolulu about Oct. 25. First two production

models of the Super-V have been released by the Federal Aviation Agency and will be used in development at Henssler, and California Glider, two new developments for more in the production line.

New Bendix Super G16 has been used as 1978 Two-Engine has been produced by Robert Parnes Co., of St. Louis, Mo. Chief pilot is second hand, other pilots are Hans L. Feller and James C. Dink. In an excess move, Bendix will be developing in the British Isles will be Short Bros. & Howard Ballist in conjunction with Aircraft Associates Ltd.

McDonnell Aircraft Corp. has selected McDonnell-Wright, Inc., St. Louis, to design and install an over-the-horizon interior in its new McDonnell 1200 jet transport.



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NASA George C. Marshall Space Flight Center, Huntsville, Ala. • NASA Wallops Station, Wallops Island, Va.



Hand-tuned small and compact yet modern design in slatted laminated fir, which is typical in this new building at Klamath Falls, Ore., is what sets it apart from the rest. It's through use of glass laminated Douglas fir members in the exterior framework for columns and beams. Building was designed by architectural firm of Vancouver, Howard & Staebach, Klamath Falls.

Laminated Fir Keynotes Small Terminal Design



No posts are required in the building, due to use of heavy laminated beams. Restaurant, lounge and kitchen are on the balcony level. Entry is suspended from the roof beams by steel rods. Total volume is 166,000 cu ft. Wall area is mostly of glass.

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ARCHIMEDES SETTLES ON FARM IN KANSAS

Well, it's not exactly Archimedes himself, in person . . . but he's actively represented by one of his best ideas. And it isn't the kind of Kansas farm that grows wheat or milo . . . actually we grow antennas.

The Boeing / Wichita "antenna farm" turns out a very valuable crop — advanced communications systems and tools. The men responsible for this harvest, and many others at Boeing / Wichita are outstanding engineers. They are also thinkers . . . idea men . . . men who are quietly contributing big, new concepts to their field and to their age.

We need more just like them. If you are the kind of senior engineer who will be right at home in this dynamic company, we want to talk to you. Write in confidence to Mr. Melvin Vobach, Dept. C-94 Boeing Airplane Co., Wichita 1, Kansas.

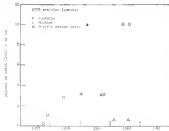
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Soviet Space Shots

The long silence between USSR efforts at placing various satellites in orbit has lulled me, in the past, into assuming the silence was in anticipation of their plans for the space research in which this silence is repeated. The first step was to place the weight of all past orbit about the earth or other celestial body in time. On this score, graphs in time scale indicate each of the successful launches with which we are now well acquainted.

Conceding now the intervals from April 1961 to Sputnik III, from Sputnik III to March 1961 from Nikoita I to Nikoita II, and from Nikoita II to Sputnik IV. These intervals are 7 months, 7 months 5 months, and 5 months respectively. (As a side note, during the long two-year gap, Nikoita II, Nikoita III, and Nikoita IV, May 14, 1960 to, two years after Sputnik III. Others, the average weight for Sputnik I, II, III, IV, was about 5,000 lb. Approximately three times that weight, the weight of each Nikoita (these satellites) was some 14,000 lb. This time the weight of a Soviet vehicle is the weight of the recent Sputnik IV and V. These two could produce a 30,000 lb. payload to be launched in six, seven, eight, or ten months or after launch.

Suppose we select further, the latest vehicle reached a velocity of some 50,000 ft/sec at launch. If the same velocity were our maximum for achieving the earth at a nominal 500 mi, orbit is substantiated from the latest rocket experiment to date at a velocity of 11,000 ft/sec. Thus, a 200 ft/sec difference in velocity would be enough to place a rocket in orbit. Suppose we choose for the Nikoita booster 1.1 ft/sec per sec, per ft, or per second the 11,000 ft/sec, for 7,400 ft/sec of payload. Add this figure to the 50,000 ft/sec. Velocity reached and we arrive at approximately a 11,000 ft/sec payload for Sputnik IV, and for Sputnik V.



during World War II, the opinion of its readers on the course taken in the magazine's editorial columns. Address Letters to the Editor, Aviation Week, 200 W. 42nd St., New York 36, N. Y. For a complete understanding of the magazine's editorial policy, the editor of letters will be withheld on request.

If this is so, then the same book would be used for all three basic shots and Sputnik IV and V. Given the fact, it is likely that the same book would be used for all three shots. It is likely that the same book would be used for all three shots. It is likely that the same book would be used for all three shots.

The results of Mr. Khrushchev at the end of the rocket to the Soviet space race. It might be added that the rocket was launched in 1961. It is likely that the same book would be used for all three shots. It is likely that the same book would be used for all three shots. It is likely that the same book would be used for all three shots.

Since one of the main goals of the Soviet space program is to launch a man into space, it is likely that the same book would be used for all three shots. It is likely that the same book would be used for all three shots. It is likely that the same book would be used for all three shots.

W. B. KROGER
Woods, Alaska Division
Lockheed Aircraft Corp.
Vancouver, Calif.

Space Power

Your recent report on the Air Force Space Vehicle Power Program in Air Force Magazine is a most interesting and timely article. It is a pity that the program is not being reported in a more comprehensive manner. It is a pity that the program is not being reported in a more comprehensive manner.

The Advanced Section Application Program of which I am a member has been directed with the aim of a response to the program to reproduce the report for the information and education of our personnel in addition, may I compliment you and your staff for producing what is undoubtedly the outstanding magazine in its field.

J. W. BRYANT
Advanced Section Application
Naval Research Department
Washington, D.C.
Lynn, Ohio

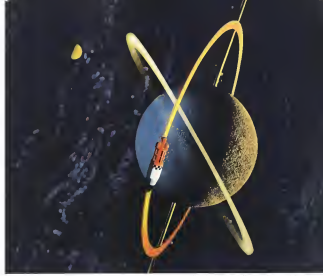
Cancellation Delay

The domestic radio complex can hardly avoid the problem of cancellation. Certainly it is a major concern for the future. It is a pity that the program is not being reported in a more comprehensive manner. It is a pity that the program is not being reported in a more comprehensive manner.

The delay in the cancellation of the program is a major concern for the future. It is a pity that the program is not being reported in a more comprehensive manner. It is a pity that the program is not being reported in a more comprehensive manner.

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W. B. KROGER
Woods, Alaska Division
Lockheed Aircraft Corp.
Vancouver, Calif.



Advanced Section Application Program of which I am a member

THE ENGINE WITH THE FUTURE

Reliability... Efficiency... Flexibility.

In space, these words have a million-dollar meaning.

With some of money and vital scientific data ride on these built-in attributes of Bell Aerospace's nuclear engine for Lockheed's Agena satellite, second stage of the Air Force Discoverer series.

The Agena engine, designed with space in mind long before space became a household word, has fulfilled its every mission and has placed more tons of useful payload into orbit than any other power plant. Its operational reliability is backed by six years of development and 5,000 test hours.

The Bell engine now has re-start capability—the first in the nation. This means that its satellite can change orbit in space without the penalty of extra engines. Presently in production, this engine also is adaptable to new fuels and new assignments and, consequently, is programmed for important military and peaceful space ventures of the future.

Agena's engine is typical of the existing projects in Bell's nuclear propulsion center. It is part of the dynamic new approach of a company that is forging ahead in rocketry, aviation and space techniques. These skills serve all government agencies. Engineers and scientists anxious for a new kind of personal challenge can find it at Bell.



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